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## 1988-1990 Wright State University Graduate Course Catalog

Wright State University

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# WRIGHT STATE UNIVERSITY



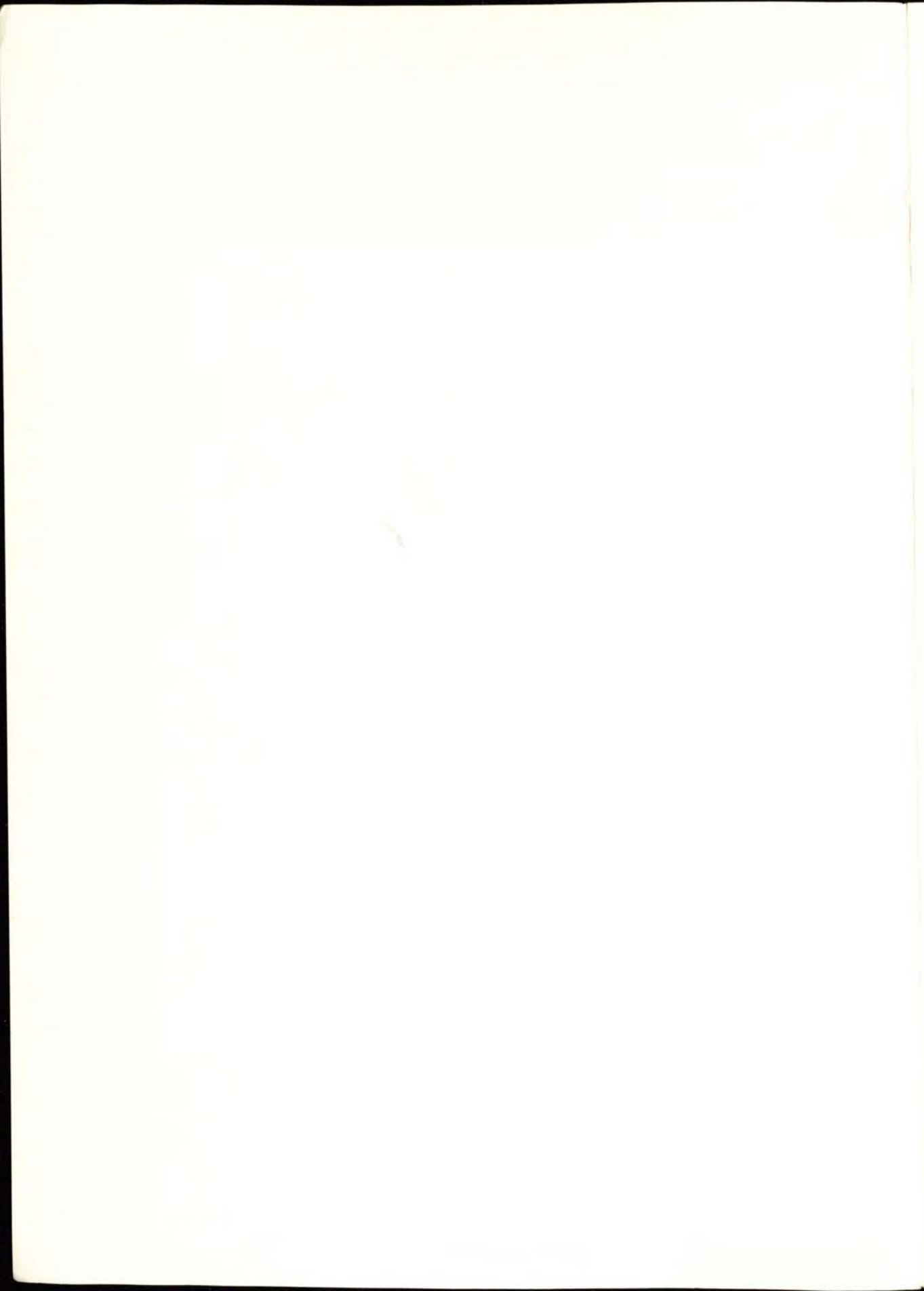
## 1 9 8 8 - 9 0 GRADUATE CATALOG

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D A Y T O N • O H I O

School of Graduate Studies





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# WRIGHT STATE UNIVERSITY



## 1 9 8 8 - 9 0 GRADUATE CATALOG

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D A Y T O N • O H I O

June 1988 Volume 19/Issue 4

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# Academic Calendar 1988/90

The material in this catalog has been prepared for information purposes and does not constitute a contract between the student and the university. The university reserves the right to make changes in policy, regulations, fees, and programs without notice.

In order to make current academic information available to students, new changes in academic policies and programs that have been made since the publication of this bulletin will be printed in the quarterly class schedules.

The course descriptions included in this catalog represent the range of graduate courses offered at Wright State by the Colleges of Business and Administration, Education and Human Services, Engineering and Computer Science, Liberal Arts, and Science and Mathematics, the School of Professional Psychology, the Wright State-Miami Valley School of Nursing, and other graduate programs. For medical school courses see the *School of Medicine Catalog*, available in the medical school Office of Student Affairs/Admissions, 210 Medical Sciences Building. For undergraduate course descriptions see the *Undergraduate Catalog*, available in the Office of Undergraduate Admissions, 127 Student Services. Not all courses are available every quarter of every year. For a listing of the specific courses offered in a particular quarter, students should consult the quarterly class schedule.

Questions concerning admission to the university or questions about academic programs should be directed to the School of Graduate Studies, Wright State University, Dayton, Ohio 45435, telephone 513/873-2975.

This catalog was prepared by the Office of University Communications, Wright State University, Dayton, Ohio.

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## Fall Quarter September 12–December 3, 1988

September 4, Wednesday/classes begin  
November 11, Friday/Veterans Day holiday  
November 23, Wednesday/classes end  
November 24–27, Thursday–Sunday/Thanksgiving holiday  
November 28–December 3, Monday–Saturday/final examinations  
December 3, Saturday/Fall Commencement

---

## Winter Quarter January 3–March 18, 1989

January 3, Tuesday/classes begin  
January 16, Monday/Martin Luther King Day holiday  
March 13, Monday/classes end  
March 14–18, Tuesday–Saturday/final examinations

---

## Spring Quarter March 27–June 10, 1989

March 27, Monday/classes begin  
May 29, Monday/Memorial Day holiday  
June 3, Saturday/classes end  
June 5–10, Monday–Saturday/final examinations  
June 10, Saturday/Spring Commencement

---

## Summer Quarter June 12–August 17, 1989

June 12, Monday/Terms A and C classes begin  
July 4, Tuesday/Independence Day holiday  
July 13, Thursday/Term A classes end  
July 17, Monday/Term B classes begin  
August 17, Thursday/Terms B and C classes end

---

## Fall Quarter September 11–December 2, 1989

September 13, Wednesday/classes begin  
November 10, Friday/Veterans Day holiday  
November 22, Wednesday/classes end  
November 23–26, Thursday–Sunday/Thanksgiving holiday  
November 27–December 2, Monday–Saturday/final examinations  
December 2, Saturday/Fall Commencement

---

## Winter Quarter January 2–March 17, 1990

January 2, Tuesday/classes begin  
January 15, Monday/Martin Luther King Day holiday  
March 12, Monday/classes end  
March 13–17, Tuesday–Saturday/final examinations

---

## Spring Quarter March 26–June 9, 1990

March 26, Monday/classes begin  
May 28, Monday/Memorial Day holiday  
June 2, Saturday/classes end  
June 4–9, Monday–Saturday/final examinations  
June 9, Saturday/Spring Commencement

---

## Summer Quarter June 11–August 16, 1990

June 11, Monday/Terms A and C begin  
July 4, Wednesday/Independence Day holiday  
July 12, Thursday/Term A classes end  
July 16, Monday/Term B classes begin  
August 16, Thursday/Terms B and C classes end



# Important Phone Numbers

## General Information

### Information Center

142 Allyn Hall  
873-2310

## Offices and Facilities

### Admissions

#### Graduate Admissions

Gerald C. Malicki, Assistant Dean and Director of  
Graduate Admissions and Records  
106 Oelman Hall  
873-2976

#### International Admissions

Harriett C. Dadras, Assistant to the Director of  
Admissions, International Admissions  
329 Allyn Hall  
873-3337

#### School of Medicine, Student Affairs/Admissions

J. Robert Suriano, Associate Dean  
210 Medical Sciences Building  
873-2934

#### School of Professional Psychology,

##### Office of Student Affairs

Omintha R. Petrie, Director  
for Student Services/Admissions  
110 Health Sciences Building  
873-3492

#### Undergraduate Admissions, Office of

Ken Davenport, Director of Undergraduate Admissions  
329 Allyn Hall  
873-2211

### Affirmative Action Programs

Juanita Wehrle-Einhorn, Director  
224 Millett Hall  
873-3207

### Bolinga Cultural Resources Center

Frank E. Dobson, Director  
179 Millett Hall  
873-2086

### Bookstore, University

Francis L. Goeggel, Director  
075 University Center  
873-2875

### Bursar, Office of the

Steven L. Rambo, Bursar  
143 Allyn Hall  
873-2021

### Educational Resources Center

Francis C. Yu, Director  
244 Millett Hall  
873-2883

### Financial Aid, Office of

David R. Darr, Director of Financial Aid  
129 Student Services  
873-2321

### Handicapped Student Services

Stephen H. Simon, Director  
133 Student Services  
873-2140/2141/3157

### Housing Office

Michael J. Coakley, Director of Housing  
042 University Center  
873-4172

### Library, University

Ritchie Thomas, University Librarian  
873-4125, Hours  
873-2525, Circulation

### Library, Fordham Health Sciences

Audrey Kidder, Fordham Health Sciences Librarian  
125D Medical Sciences Building  
873-2003

### Registrar, Office of the

Louis E. Falkner, Registrar  
145 Allyn Hall  
873-2451

### Student Employment, Office of

Shelley A. Donnelly, Coordinator  
152 Allyn Hall  
873-2326

### University Testing Services

Pasquale D. Caprio, Assistant Director,  
University Division  
131 Student Services  
873-2945/2841

### Veterans Affairs, Office of

David R. Darr, Coordinator, Veterans Affairs  
151 Allyn Hall  
873-2727

## Colleges and Schools

### College of Business and Administration

110 Rike Hall  
873-2437

### College of Education and Human Services

228 Millett Hall, Graduate Studies Office  
873-2821

### College of Engineering and Computer Science

130 Engineering and Mathematical Sciences Building  
873-2403

### College of Liberal Arts

445 Millett Hall  
873-2225

### College of Science and Mathematics

134 Oelman Hall  
873-2611

### School of Graduate Studies

106 Oelman Hall  
873-2975

### School of Medicine

110E Medical Sciences Building, Administrative Offices  
873-3010, Receptionist

### School of Professional Psychology

117 Health Sciences Building  
873-3490

### School of Nursing, Wright State University- Miami Valley

401 Allyn Hall  
873-3131

### Wright State University Lake Campus

100 Dwyer Hall  
7600 State Route 703  
Celina, Ohio 45822  
1-800-237-1477  
419/586-2365

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# Graduate Program Officers

## School of Graduate Studies

Donald C. Thomas, Dean and Associate Vice-President for Research  
Gerald C. Malicki, Assistant Dean and Director of Graduate Admissions and Records  
John M. Kimble, Associate Director of Graduate Admissions and Records and Program Evaluation Coordinator

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Rishi Kumar, Associate Dean for Academic Programs  
James C. Crawford, Director of Graduate Programs in Business and Economics

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### **Economics**

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### **Finance, Insurance, and Real Estate**

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Charles L. Willis, Associate Dean

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#### **Advanced Programs in Educational Leadership**

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#### **Curriculum and Supervision**

Gerald P. Sturm

#### **Principalship**

Gerald P. Sturm

#### **Teacher Leader**

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#### **Business and Industry**

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#### **Chemical Dependency**

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#### **Community Mental Health**

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#### **Gerontology**

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### **School Psychology**

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### **Rehabilitation Counseling**

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#### **Art Education**

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#### **Classroom Teacher**

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#### **Early Childhood**

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#### **Educational Media**

Bonnie K. Mathies

#### **Reading Specialist**

T. Stevenson Hansell

#### **Special Education**

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### **Division of Health, Physical Education, and Recreation**

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Mark E. Low, Associate Dean  
Clark E. Beck, Assistant Dean

### **Computer Science and Engineering**

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### **Systems Engineering**

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## College of Liberal Arts

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William E. Rickert, Associate Dean

### **English Language and Literatures**

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### **History**

Tsing Yuan, Chair

### **Humanities**

Nicholas Piediscalzi

### **Music**

Gwen L. Brubaker

## School of Medicine

John O. Lindower, Interim Dean and Associate Dean for Academic Affairs

### **Aerospace Medicine**

Stanley R. Mohler

**Wright State University-Miami Valley  
School of Nursing**

---

Jeanette Lancaster, Dean  
Donna M. Deane, Associate Dean for Research and Development  
Virginia N. Nehring, Associate Dean for Academic Affairs

**School of Professional Psychology**

---

Ronald E. Fox, Dean  
Allan G. Barclay, Associate Dean for Academic Affairs

**College of Science and Mathematics**

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Marc E. Low, Associate Dean  
Arlene F. Foley, Assistant Dean

**Biological Sciences**

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*Biochemistry*

Robert A. Weisman, Chair

*Biological Sciences*

John D. Rossmiller, Chair

*Microbiology and Immunology*

David J. Giron, Acting Chair

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George G. Hess, Chair

**Geological Sciences**

Raphael Unrug, Chair

**Mathematics and Statistics**

Edgar A. Rutter, Chair

**Physics**

Merrill L. Andrews, Chair

**Other Graduate Programs**

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*Applied Behavioral Science*

Helen A. Klein

*Biomedical Sciences*

Larry G. Arlian, Director

*Selected Graduate Studies*

Donald C. Thomas

## **Graduate Council Members**

**School of Graduate Studies**

---

Donald C. Thomas, Dean and Chair  
Gerald C. Malicki, Dean's Alternate

**College of Business and Administration**

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Waldemar M. Goulet, Dean  
Rishi Kumar, Dean's Alternate  
Khurshid Ahmad, Faculty Member, 1987-89  
Nabil Hassan, Faculty Member, 1986-88  
Stephen Renas, Faculty Alternate, 1987-88

**College of Education and Human Services**

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Frederick J. Gies, Dean  
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Mary Lou White, Faculty Member, 1987-89  
William E. Brown, Faculty Member, 1986-88  
R. A. Pendergrass, Faculty Alternate, 1986-88

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Amir Faghri, Faculty Member, 1987-89  
Alton Sanders, Faculty Alternate, 1987-88

**College of Liberal Arts**

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James H. Hughes, Faculty Member, 1987-89  
Ron C. Fetzer, Faculty Alternate, 1986-88

**School of Medicine**

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J. Robert Suriano, Dean's Alternate

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Peter Lauf, Faculty Member, 1986-88  
Daniel Organisciak, Faculty Alternate, 1987-88

**Wright State University-Miami Valley  
School of Nursing**

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Janis Campbell, Faculty Member, 1987-89

**College of Science and Mathematics**

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Paul Servé, Faculty Member, 1987-89  
Harry Khamis, Faculty Alternate, 1987-88

**School of Professional Psychology**

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Allan G. Barclay, Dean's Alternate  
Darold Engebretson, Faculty Member, 1987-89  
Jeffrey Wilbert, Faculty Member, 1987-89  
Larry Cesare, Faculty Alternate, 1987-89

**Biomedical Sciences Ph.D. Program**

---

Larry G. Arlian, Director

**Student Government Representative**

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Chetan Jariwala

**Ex Officio**

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Charles E. Hathaway



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## WRIGHT STATE UNIVERSITY







## History

Wright State University is a state-assisted university accredited by the North Central Association of Colleges and Schools. Wright State offers a student population of over 17,000 more than one hundred undergraduate majors, twenty-seven master's degree programs, a post-master's degree program, and programs of study for the Ed.D., M.D., Psy.D., and Ph.D. degrees. (Two of Wright State's doctoral-level programs are offered in cooperation with other universities: the Ph.D. in education is offered in cooperation with Bowling Green State University, and the Ed.D. is offered in cooperation with Indiana University.)

Wright State has reached this stage in its growth just twenty-four years after opening its doors in 1964 as the Dayton Campus of Miami University and The Ohio State University. These schools had been offering classes in borrowed facilities in the area for many years, giving rise in the 1950s to the idea of a joint branch campus. A community fundraising effort in 1961 generated three million dollars, which financed the purchase of a 618-acre campus site near Dayton, Ohio, and the construction of Allyn Hall, the first building on campus.

In 1965, the Wright State Campus became Ohio's twelfth state-assisted university. A major turning point was reached in October 1967, when Wright State became an independent state institution. Wright State University was then recognized as accredited and autonomous. Since its inception, Wright State had grown from a faculty of fifty-five and a student population of 3,200 to a university with 5,000 students registered in ninety-six different programs and concentrations, master's degree programs in five disciplines, and 206 faculty members. Three new buildings had been constructed, completing Founders Quadrangle in the center of campus.

Since that time, Wright State's history has continued to be characterized by growth and change. The residence hall opened in 1970, followed by the completion of the University Center and the president's house in 1971. In 1973, Wright State celebrated the openings of the Creative Arts Center, the University Library, the Physical Education Building, and the Brehm Laboratory. Facilities for the biological sciences were completed in 1975 and 1976, and the Medical Sciences Building was dedicated in 1976. New offices,



bringing together student services in one central location, were completed in 1977.

The creation of the Wright State University School of Medicine in 1974 marked Wright State's first professional doctorate and indicated its commitment to providing resources for primary health care. The first class of medical doctors graduated in 1980. Wright State received authorization in 1977 to establish the School of Professional Psychology, and the school graduated its first class in 1982. Planning approval was also granted in 1977 for a Ph.D. program in biomedical sciences. The first class of biomedical sciences doctoral students was admitted in 1979 and the first Ph.D. degree was conferred in 1984.

In 1981, construction was completed on Rike Hall, housing the College of Business and Administration, and the Frederick A. White Center, which is both a teaching facility and a center for health care services. Two new buildings opened in 1984: the Health Sciences facility, which houses the administrative offices of the School of Professional Psychology and the Health Sciences animal laboratories; and the Engineering and Mathematical Sciences Building.

Final approval for a Ph.D. degree program in computer science and engineering was granted in 1986. Also in 1986, the College of Science and Engineering was reorganized into two separate colleges, the College of Engineering and Computer Science and the College of Science and Mathematics.

Since its beginning in 1964, Wright State has continually expanded and responded to community needs. Wright State has grown from a branch campus to a fully independent, comprehensive university with a 557-acre campus, which includes a 200-acre wooded biological preserve. Through the Colleges of Business and Administration, Education and Human Services, Engineering and Computer Science, Liberal Arts, and Science and Mathematics; the Schools of Graduate Studies, Medicine, Nursing, and Professional Psychology; and the Lake Campus between Celina and St. Mary's, Wright State offers a balanced university program, committed to excellence and community service.

## Mission

Wright State University is a comprehensive public university dedicated to advancing and disseminating knowledge through the pursuit of excellence in teaching, research, and professional service. Fundamental to the university mission and central to all disciplines are superior teaching and scholarly activity addressing basic questions and the needs of society. Professional service balances the commitment of the university through applied research, technical assistance, cultural activities,

clinical services, consultation, and similar noninstructional activities and services.

Wright State is a metropolitan university. It is committed to providing leadership addressing the educational, social, and cultural needs of the Greater Miami Valley and to promoting the economic and technological development of the region through a strong program of basic and applied research and professional service. WSU Lake Campus, its regional branch campus, is committed to providing comprehensive two-year educational and community services to western Ohio.

Wright State desires to create an intellectually exciting community and encourages all students and faculty to strive for excellence. It attempts to foster a learning environment that nurtures innovative teaching and vital intellectual and personal relationships among students and teachers. It is committed to strong educational programs in the liberal arts and sciences as a foundation for all undergraduate degree programs. The university strives to develop fully the intellectual potential and aesthetic sensitivity of each student, including the skills of inquiry, reasoning, and expression. Through its professional programs the university seeks to impart essential skills, competencies, and attitudes students need for successful careers today and tomorrow. While its educational programs convey knowledge from the past and present, the university aspires to educate students for the future. To that end, it undertakes to make all students aware of the importance of the international environment.

Wright State intends to achieve national prominence through excellence in selected program areas. The university emphasizes undergraduate education through a wide range of baccalaureate degree programs in the arts, humanities, social and natural sciences, and several professional fields. Master's, specialist, and doctoral degree programs are offered in selected fields. Wright State is committed to providing the opportunity for lifelong learning and professional development through programs for both degree and nondegree students.

As a state-assisted university, Wright State maintains an open admissions policy. It is also committed to enrolling outstanding traditional and nontraditional students and those bound by place, time, economic, or other personal constraints. The university emphasizes access and services to persons with disabilities. All programs and services are open to qualified persons without regard to race, religion, marital status, gender, age, economic status, ethnic origin, or political belief.

Wright State provides a broad range of support services for the achievement of its educational goals and the development of its students. It seeks to meet the needs of its diverse student population through flexibility in the type, availability, and delivery of these services.



Wright State aspires to be a community bound together for a common purpose on a campus that is functional, aesthetically pleasing, and truly accessible. The university seeks to promote a sense of community among students by involving them in educational, cultural, social, and athletic activities. This sense of community is further fostered by engaging faculty, staff, alumni, and friends in advancing the interests of the university and by observing high standards of social responsibility, including equal access to education, equal opportunity, and affirmative action.

Wright State adheres to the principle of participatory governance. The university defends academic freedom as important for intellectual inquiry and the development of ideas but recognizes that academic freedom imposes on individuals special obligations of accuracy, appropriate restraint, and respect for the rights and opinions of others.



## Equal Opportunity/Affirmative Action Policy

Wright State University is committed to achieving full equal opportunity in all aspects of university life. We are proud of the diversity of the university community and strive to make all members of the community feel welcome.

The policy of Wright State University is to not discriminate against any persons on the basis of race, religion, color, sex, sexual orientation, disability, veteran status, national origin, age, or ancestry. In addition, we take affirmative action to recruit and assist members of various racial or ethnic groups, women, Vietnam-era veterans, and persons with disabilities whose ability to achieve academic success might otherwise be unrecognized because of cultural barriers. Our policy is fully consistent with the various federal and Ohio statutes which prohibit discrimination.

Any questions or comments about the university's policy, and any complaint about perceived discrimination, may be directed to the director of Affirmative Action Programs, 224 Millett Hall, 513/873-3207.

The university's Affirmative Action Plan is maintained in the Office of Affirmative Action Programs. Wright State is a public institution, and any member of the public may request a copy of the plan.

In addition, Wright State University is a national leader in accommodating the needs of students with disabilities. Any questions or comments concerning a needed accommodation may be directed to Stephen Simon, Director of Handicapped Student Services, 133 Student Services, 513/873-2141.

## Profile

Now a university with 17,066 students (3,711 graduate and professional students) as of fall quarter 1987, the university has more than one hundred programs of study leading to ten different baccalaureate and four different associate degrees and more than thirty programs of graduate and professional study.

Most students at Wright State are commuters. About 96 percent regularly travel to campus for classes. Ninety-six percent of the students are from Ohio with 75 percent from the nearest four counties—Montgomery, Greene, Clark, and Miami.

## Accreditation and Memberships

Wright State is accredited by the North Central Association of Colleges and Schools at the doctoral degree-granting level. Also, programs in the College of Education and Human Services are accredited by the State of Ohio Department of Education and the National Council for Accreditation of Teacher Education; music programs are accredited by the



National Association of Schools of Music; art therapy by the American Art Therapy Association; undergraduate and graduate business programs by the American Assembly of Collegiate Schools of Business; social work by the Council on Social Work Education; environmental health by the Accrediting Council for Environmental Health Curricula of the National Environmental Health Association; medical technology by the Committee on Allied Health Education and Accreditation of the National Accrediting Agency for Clinical Laboratory Scientists; the School of Medicine by the Liaison Committee on Medical Education; the School of Professional Psychology's clinical psychology and internship programs by the Committee on Accreditation of the American Psychological Association; the College of Engineering and Computer Science's systems engineering, materials science and engineering, and computer engineering programs by the Accreditation Board for Engineering and Technology and the computer science Bachelor of Science program by the Computer Science Accreditation Commission; and the School of Nursing by the National League for Nursing and the State of Ohio Board of Nursing Education and Nurse Registration. In addition, the Bachelor of Science program in chemistry is certified by the American Chemical Society, and the Wright State University Lake Campus is accredited by the North Central Association of Colleges and Schools at the associate degree-granting level.

Wright State holds memberships in numerous organizations, including the American Assembly of Collegiate Schools of Business, the Midwestern Association of Graduate Schools, the Council of Graduate Schools, the National University Extension Association, the Ohio College Association, the Association of Urban Universities, the American Association of State Colleges and Universities, the American Council on Education, the American Association of Colleges, the American Association of Colleges of Nursing, the Council of Baccalaureate and Higher Degree Programs of the National League for Nursing, the Midwest Alliance in Nursing, the Association of Graduate Liberal Studies Programs, and the Association of American Medical Colleges.

Wright State participates in many kinds of cooperative ventures with local colleges, universities, and other institutions. Through the Southwestern Ohio Council for Higher Education, an association of twenty-four colleges, universities, and corporations, Wright State students may take courses at member institutions and also take advantage of their library facilities. The School of Medicine has cooperative arrangements with Central State and Miami Universities, and the School of Nursing has implemented a collaborative agreement with Miami Valley Hospital. Both of these schools work closely with many area hospitals. The College of Engineering and Computer Science has developed a cooperative arrangement with Central State University, so that students may take the first two



years of the baccalaureate systems engineering program at Central State and the final two years at Wright State, and be awarded the baccalaureate degree from Wright State University. Two doctoral-level programs are offered through agreements with two universities outside of the area: the Ph.D. degree in educational administration and supervision is offered in cooperation with Bowling Green State University and the Ed.D. in counselor education and in school administration in cooperation with Indiana University. The WSU Lake Campus offers programs and courses in conjunction with Lima Technical College and the Lima Branch Campus of The Ohio State University. Wright State's telecommunications department works with the University Regional Broadcasting Corporation, a joint program of Wright State, Central State, and Miami Universities. In addition, the Sanders Judaic Studies Program, providing scholarship and teaching in the field of Judaic studies, is made possible through the cooperative effort of Wright State, United Theological Seminary, and the University of Dayton.

## Academic Organization and Programs

Academically, the university is organized into eleven units. Undergraduate degrees are awarded through the Colleges of Business and Administration, Education and Human Services, Engineering and Computer Science, Liberal Arts, Science and Mathematics, and the School of Nursing. Master's degree are awarded through the School of Graduate Studies and the departments offering graduate programs. The University Division serves underclass students, especially first-year students, in the areas of advising, academic



placement, and tutoring. The university offers a doctoral-level academic degree in biomedical sciences through the College of Science and Mathematics and the School of Medicine, a doctoral-level academic degree through the College of Engineering and Computer Science, and doctoral-level professional degrees through the School of Medicine and the School of Professional Psychology.

## Graduate Programs

The graduate programs at Wright State University provide advanced professional training in the area of a student's field of specialization and afford opportunities to conduct research and special investigations. The program of graduate study should become an initiation into methods of intensive study and research in some selected area of knowledge. It is the objective of the School of Graduate Studies to provide its students with a high level of professional competence.

The following are the graduate degree programs and their concentrations.

### Master's Degrees

*Aerospace Medicine/M.S.*

*Applied Behavioral Science/M.A.*

*Art Therapy/M.A.T.*

*Biology/M.S.*

Anatomy, Biochemistry, Biological Sciences, Microbiology and Immunology, Physiology and Biophysics

*Business Administration/M.B.A.*

Accountancy, Finance, Financial Administration, Health Care Management, Logistics Management, Management, Management Science, Marketing.

*Chemistry/M.S.*

*Classroom Teacher/M.A., M.Ed.*

Art, Business, Computer Education, Early Childhood, Elementary Certification, General, International Literature for Children, Math, Media, Physical Education, Reading, Retraining, Secondary Certification, Science, Special Education (Children and Youth with Multiple Impairments, Developmentally Handicapped, Gifted, and Learning Disabilities/Behavior Disorders)

*Computer Engineering/M.S.C.E.*

*Computer Science, /M.S.*

*Counseling/M.A., M.S., M.R.C.*

Business and Industrial Counseling Management, Chemical Dependency Rehabilitation Counseling, Counseling Exceptional Children, Gerontology, Marriage and Family, Mental Health, Severely Disabled Rehabilitation Counseling, Student Personnel Services in Higher Education

*Earth Science/M.S.T.*

*Educational Leadership/M.A., M.Ed.*

Educational Leadership General: Administrative Specialist Certification Options: Business Management, Instruction, Pupil Personnel, Research, Special Education, School and Community Relations, Staff Personnel Administration; Curriculum and Supervision: Computer Facilitator, General, Media, Special Education, Teacher Leader, Assistant Superintendent, Principalship.

*English/M.A.*

*Geological Sciences/M.S.*

*History/M.A.*

*Humanities/M.Hum.*

*Logistics Management/M.S.*

*Mathematics/M.S.*

Applied Mathematics, Mathematics, Statistics

*Music Education/M.Mus.*

*Nursing/M.S.*

*Physics/M.S., M.S.T.*

*Selected Graduate Studies/M.A., M.S.*

*Social and Applied Economics/M.S.*

*Student Personnel Services/M.A., M.Ed.*

School Counseling, Visiting Teacher

*Systems Engineering/M.S.*





**Educational Specialist Degree/Ed.S.*****Educational Leadership***

Curriculum and Instruction  
Superintendency

**Doctor of Philosophy Degrees/Ph.D.*****Biomedical Sciences Program***

The university's first academic doctoral program, leading to a Ph.D. in biomedical sciences, began in the fall of 1979. Cooperatively offered by the College of Engineering and Computer Science, the College of Science and Mathematics, and the School of Medicine, this program is interdisciplinary, innovative, and staffed by the largest program faculty on campus. The first year of study consists of a basic biological core, followed by a series of advanced interdisciplinary courses and laboratory practica. Upon successful completion of candidacy examinations, students pursue dissertation research. Undergraduate students majoring in biology, chemistry, psychology, physics, engineering, and mathematics may be accommodated in the program.

***Computer Science and Engineering***

The Ph.D. in computer science and engineering is open to students with degrees in computer science, computer engineering, or related areas and appropriate experience. The program is offered by the computer science and engineering faculty plus other qualified faculty from the College of Engineering and Computer Science and the College of Science and Mathematics, particularly faculty of the Department of Mathematics and Statistics and the Department of Electrical Systems Engineering. The program contains both traditional and innovative components and consists of two phases. The first phase, approximately two years of concentrated study beyond the baccalaureate degree, culminates with the General Examinations. Those who pass the exams (demonstrating a knowledge of computer architecture, software systems, theory, and either programming languages or stochastic analysis/information theory) begin the research phase, which requires another two years. Doctoral students choose research topics that are theoretical, practical, or both; demonstrate the use of rigorous scientific procedures; and produce original results that make a recognizable contribution to the field. Most courses are offered in the late afternoon to allow practicing computer professionals to begin the program on a part-time basis.

***Educational Administration and Supervision***

Beginning fall quarter 1985, Wright State, in cooperation with Bowling Green State University, began offering the Ph.D. degree in education (educational administration and supervision).

**Professional Doctoral Degrees*****Doctor of Medicine/M.D.***

The School of Medicine educates physicians, placing emphasis on primary care, and awards the Doctor of Medicine (M.D.) degree. Within the context of preparing physicians to meet the needs of patients and society, the school conducts research, encourages the generation of new knowledge, and maintains continuing and graduate medical education programs.

Affiliated with twenty-eight hospitals and health care facilities in the Dayton-Miami Valley region, the school features a four-year curriculum with instruction in twenty-four departments and programs. Integrated or affiliated graduate medical education (residency) programs are conducted in the following disciplines: aerospace medicine, anesthesiology, dermatology, emergency medicine, family practice, general surgery, internal medicine, internal medicine/pediatrics, obstetrics and gynecology, orthopedic surgery, pathology, pediatrics, plastic surgery, psychiatry.

The School of Medicine catalog may be obtained from the medical school admissions office.

***Doctor of Education/Ed.D.***

Beginning fall quarter 1985, Wright State began offering the Ed.D. degree in school administration and in counselor education in cooperation with Indiana University.

***Doctor of Psychology/Psy.D.***

The School of Professional Psychology educates professional psychologists, offering a four-year postbaccalaureate program leading to the Doctor of Psychology degree (Psy.D.). Although the program primarily admits postbaccalaureate students, consideration will be given to advanced-standing students when circumstances so indicate. The program is centered around the education and training of professional psychologists. It is expected that these individuals will be primarily oriented to the application of the knowledge base of psychology to the resolution of human problems encountered in social and organizational contexts and other life situations. The emphasis is on preparing professionals who will be thoroughly grounded in the basic science and profession of the discipline of psychology.

Students are selected from a diverse range of backgrounds, attitudes, and experiences in order to ensure a broad representation of social, cultural, and ethnic origins that reflect the pluralistic nature of our society, and will be expected to master the fundamental knowledge of psychology and the factors that may determine or influence human behavior. In addition, there will be a particular emphasis on the attainment of those practical skills that will assist students in functioning as professional psychologists in diversified real life/real world



settings. Of particular note is the fact that students will be expected to work in close conjunction with practicing professional psychologists in a variety of practicum and internship placements.

The School of Professional Psychology catalog may be obtained from the school's admissions office.



## Resources

### Libraries

#### The University Library

The University Library is a focal point for many graduate programs at Wright State since its collections and services support the course-related and independent research projects of graduate students and faculty.

The collection contains over 400,000 bound volumes, 791,000 microforms, 266,000 U.S. and Ohio government documents, and 49,000 pieces of nonprint media. Since the collection is only twenty years old, the emphasis is on current materials, yet important older resources have also been acquired. Many of the 4,966 periodical subscriptions include significant back files.

Archives and Special Collections is an area of special interest to graduate students since the collections contain primary research materials such as manuscripts, archival records, and special book collections. The archives house one of the world's most complete depositories of information on the Wright brothers. The Wright State collection of about 6,000 historical items includes manuscripts and records, a library of books that influenced the Wright brothers, technical journals that covered their progress, family papers, awards, and over 3,600 prints made by Orville and Wilbur Wright from their own negatives.

The archives also contain many other important collections such as the papers of Dayton newspaper publisher and former Ohio governor James M. Cox, the records of the Miami Conservancy District, and the records of the Dayton and Springfield Urban Leagues.

Students and the general public who need access to maps can make use of the national map depository in the University Library. The map depository collection includes approximately 55,000 geological and topographical maps from all over the United States.

The reference staff of the University Library is eager to assist graduate students in their use of the collections. The staff offers bibliographic instruction and assistance in developing workable research strategies.

The music library, located in the Creative Arts Center, houses recordings and musical scores. Sophisticated audio reproduction equipment is available there for students to use.

Since no single academic library can possibly collect all the materials that its many graduate students and faculty members require for their research, Wright State actively supports and participates in a number of local and nationwide cooperative programs. Interlibrary loan service ensures that virtually anything required by students



can be obtained in a week's time. Wright State's membership in the Southwestern Ohio Council for Higher Education and its arrangements with the other Ohio state-assisted universities facilitate the interlibrary loan process. *The Union List of Serials in the Miami Valley*, available at the reference desk, locates holdings of more than 24,000 serial titles in ninety area libraries.

#### **Fordham Health Sciences Library**

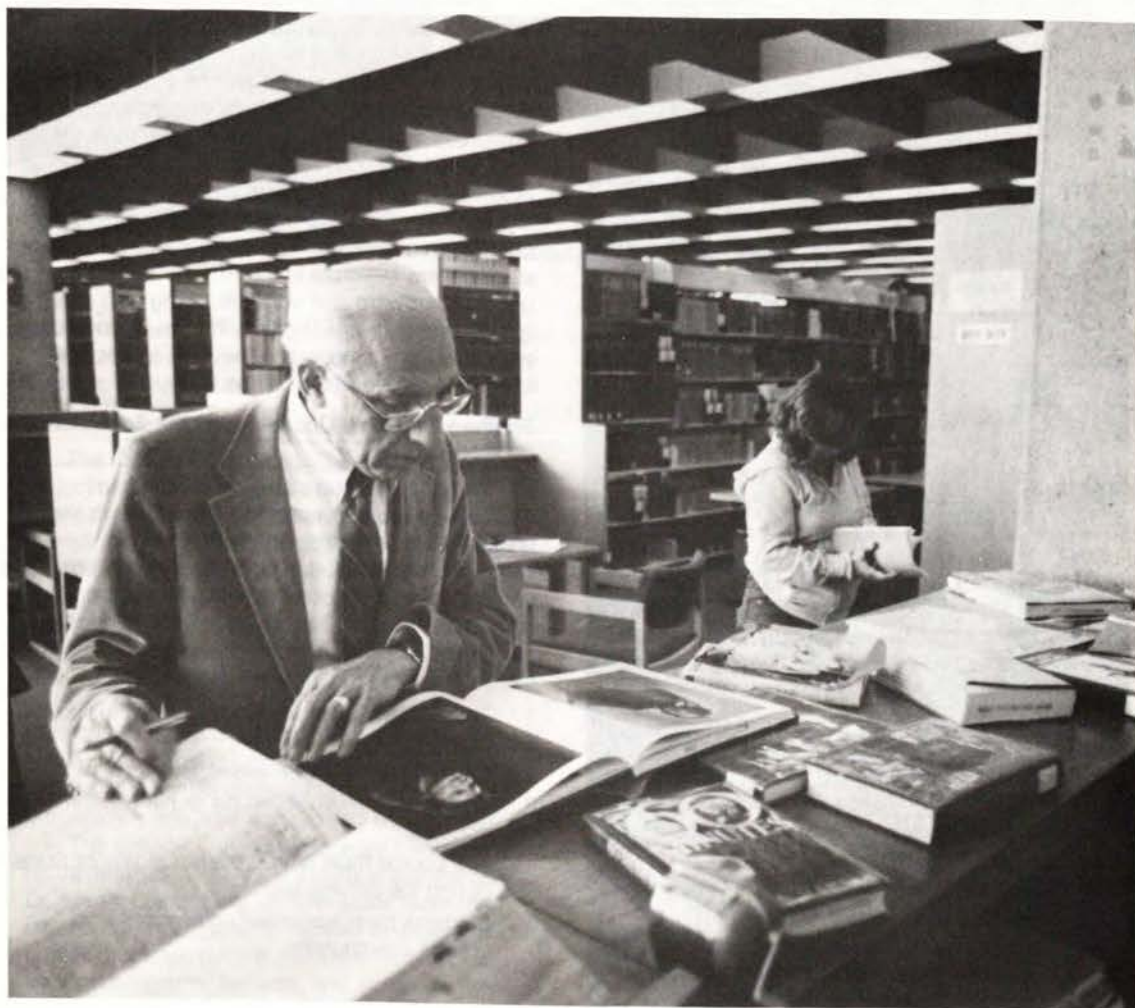
The Fordham Health Sciences Library supports the health sciences educational and research needs of the students and faculty at Wright State University.

The Fordham Health Sciences Library is located in the Medical Sciences Building on the Wright State University campus. A substantial gift to establish the facility and develop its collection was made by Mrs. Thelma Fordham Pruett as a memorial to her late husband and son, Thomas B. Fordham, Sr., and Thomas B. Fordham, Jr. The collections number 84,000 volumes and 1,300 current serial subscriptions.

Reference staff members assist users in finding information in the library's books and periodicals; in using the indexes, abstracting journals, and bibliographies; and in guiding readers in the most efficient and effective use of the library's resources. The reference staff also searches on-line over two hundred computerized indexes, abstracts, and bibliographic information banks to produce tailor-made subject bibliographies in the biomedical and life sciences. Library materials that are unavailable from the Fordham Health Sciences Library may be requested through the library's interlibrary loan service.

Audiovisual software, including slide sets, slide/tapes, videotape programs, and microforms may be used in the Learning Resources Center's individual study carrels and group study rooms.

Special collections include the McFarland Collection in aerospace medicine and human factors engineering, the Aerospace Medical Association Archives, and the Wright State health sciences programs archives. The Thelma Fordham Pruett





## 16 Wright State University

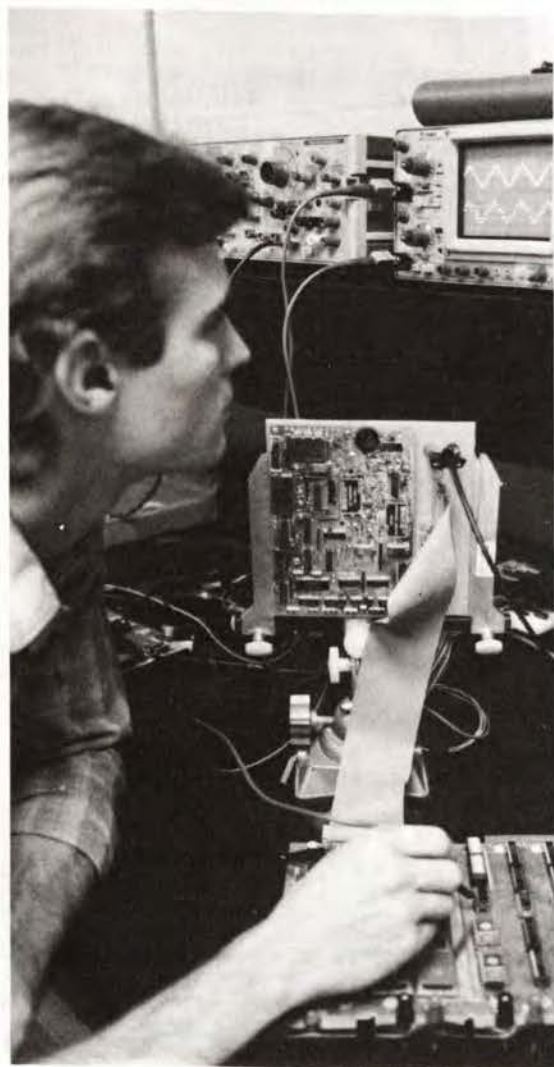
Rare Book Room houses rare American eighteenth- and nineteenth-century medical books.

A unique cooperative relationship among the area's hospital libraries and the Fordham Health Sciences Library promotes sharing and nonduplication of library materials as well as reciprocal library services for students and professionals in the health care fields. Over 100,000 volumes in these affiliated libraries complement the library's collections. Four of the hospital libraries participate in COLS, the university-wide library public access and circulation system.

### Other Resources

#### University Media Services

University Media Services provides a wide range of services including comprehensive production services, consultation in media utilization and selection, a large collection of audio-visual equipment and materials, learning lab facilities,



preview facilities, and media supplies. Our mission is to provide these services to support the academic, research, promotional, and outreach activities of the university.

All services provided by the department are available to the entire university community. While many services are provided at no charge, user fees are assessed for some services. Complete rate cards for various services are available in any media services office.

#### Computer Services

Computing services for the university are provided by University Computing Services. This department provides central computer support for the entire campus. The department is made up of three units: Academic Computing Resources (ACR), Administrative Information Systems (AIS), and the Information Center (IC). ACR provides the specialized and general purpose computing software and hardware needed to support the instructional and research needs of the university. UCS through AIS also provides support for administrative offices throughout the campus. The IC group provides information to the entire university related to personal computers and Local Area Networks (LAN).

The main computing equipment consists of an IBM 3083B and a VAX 785. Other computing resources are located in various departments throughout campus, including several large laboratory facilities. Numerous software packages are available for general use. Information and guidance on hardware and software for faculty and students are available in the ACR. Information on the general hardware and software, along with services, is available in the ACR office. The major computing equipment on campus and the ACR offices are located in the basement of the library.

#### Southwestern Ohio Council for Higher Education (SOCHE)

Wright State students have hundreds of additional classes available to them through the university's membership in the SOCHE, an association that includes eighteen area colleges and universities and six corporations with regional or home offices in the Dayton area. Full-time students at Wright State may cross-register for credit at member institutions under the following conditions:

- 1 The student must pay Wright State's tuition rates.
- 2 Class space must be available.
- 3 The student must obtain his or her adviser's consent.
- 4 The course must not be offered at Wright State during the current quarter.
- 5 Students must also meet course and host college prerequisites.





SOCHE also offers cooperative library privileges to students at all member institutions. These library holdings total more than a million volumes.

#### **Resources for Special Interests**

The Office of Community Service (OCS), a project of SOCHE, handles educational and community research and cable television. Periodically, OCS offers college courses through a few of SOCHE member schools, using the resources of cable television.

The Office of Preprofessional Advising at Wright State provides assistance to students whose plans include further study in medical, or related health, law, or other professional schools. The office maintains a reference library of professional school catalogs and advises students about careers and professional school curricula, application procedures, entrance exams, and financial aid.

The Bolinga Cultural Resources Center opened on January 15, 1971, as a tribute to the memory of Dr. Martin Luther King, Jr. The word "Bolinga" means love in Lingala, an African language, and the center promotes cultural pluralism on campus through programs, lectures, and seminars. The

center's programs consist of a minority scholars speakers series, community speakers series, and film series. Moreover, it has two important resources: the Paul Laurence Dunbar Library, a collection of over 3,000 books and periodicals relating to the African and African-American experience, and the Peer Supportive Services Program, a program of tutoring and counseling services.

In 1977, the university was designated a National Center for Arts for the Handicapped. Because of Wright State's progressive programs in the area of art therapy, the National Committee of Arts for the Handicapped (now Very Special Arts/VSA) selected the university as one of only four national resource centers. Wright State was the only university to be so designated. The university continues to be associated with Very Special Arts, and the state office is now housed at Wright State.

The Organizational Services Group (OSG) provides valuable information and services both to the university community and to the community at large. It is composed of six different centers: Consumer and Business Research, Economic Education, Financial Services, Professional Development, Research Development, and Small Business Assistance.



The Department of English Language and Literatures offers a certificate program and a master's degree option in Teaching English to Speakers of Other Languages (TESOL); this program provides an optional six-month practicum in Japan. The Department of English Language and Literatures also offers a certificate program and a master's degree option in professional writing, which includes an internship in a Dayton-area business or educational institution.

The university's Educational Resources Center houses educational kits and games, textbooks, resource units, curriculum guides, and standardized tests. The Media Production Lab provides facilities and services for producing materials for class requirements. The Microcomputer Lab provides classroom instruction and open lab time for faculty, staff, and students.

## Assistantships, Fellowships, and Financial Aid

Financial aid available to graduate students includes graduate assistantships, graduate fellowships, Perkins Loans, Guaranteed Student Loans, College Work-Study employment, and short-term loans. Information concerning applications for graduate assistantships or fellowships may be obtained directly from the department concerned or the School of Graduate Studies. Other types of financial aid are handled through the Office of Financial Aid in Student Services.

Financial aid awards cannot be final until students have completed the admission process. Entering students should be sure that a transcript of credits has been sent to the School of Graduate Studies.

### Assistantships/Fellowships

Assistantships and fellowships are awarded through individual departments of instruction; assistantships require students to spend a specified amount of time assisting either in instruction or in research. The balance of students' time is devoted to graduate studies. Graduate assistants are required by the graduate school to register for a minimum of eight hours of graduate credit per quarter and some departments may require as many as fifteen credit hours per quarter. (A maximum of six credit hours for each five-week summer term is considered the normal load.) Fellows are required to register for a minimum of twelve credits per quarter.

Continuation of graduate appointment contracts depends on satisfactory academic (minimum 3.0 grade point average) and assistantship performance. For information regarding

assistantships or fellowships, contact the chair of the department involved or the School of Graduate Studies. Applicants for graduate assistantships must complete a Graduate Assistantship Application form. Financial need is not a criterion for selection of graduate assistants; the Financial Aid Form (FAF) discussed in the following section on Financial Aid applies to other forms of financial assistance.

### Financial Aid

In addition to filing a Wright State University application for financial aid, students and/or their parents must fill out a Financial Aid Form (FAF), or a Graduate and Professional School Financial Aid Service Financial Statement (GAPSFAS) if more convenient, and send it to the appropriate financial aid service. These forms may be obtained from the Office of Financial Aid. The FAF or GAPSFAS must be submitted no later than March 31 for the succeeding academic year to determine eligibility for the Perkins Loan, the Guaranteed Student Loan program, and College Work-Study employment program.

### Wright State University Graduate Academic Fellowships (Scholarships)

The Wright State University Foundation awards graduate academic fellowships based on academic performance, potential, and letters of recommendation. Financial need is not a consideration in these awards. The required application and detailed information can be obtained from the School of Graduate Studies.

### Professional Nurse Traineeships

The Professional Nurse Traineeship program was established in 1956 and expanded in 1975 to provide financial support to currently licensed professional nurses to study full time, to teach, to serve in administrative or supervisory capacities, or to serve in other professional nursing specialties requiring advanced training. Financial need is not a consideration in these awards. The required application and information can be obtained in the School of Nursing Office of Student Affairs.

### Perkins Loans

Since 1958, the federal government has been allocating federal funds to institutions of higher education, to be lent to students who need financial assistance to attend college. Students may borrow up to \$18,000 during the undergraduate and graduate years. The amount received each year is determined by students' computed financial need through the FAF.

The repayment period and interest on these loans do not begin until nine months after the student terminates at least half-time enrollment. The



loan bears interest at the rate of 5 percent per year and repayment may be extended over a ten-year period. For students who become teachers of handicapped students (mentally, physically, emotionally, or economically handicapped), a certain percentage of these loans is canceled each year.

### **Guaranteed Student Loan Program**

Through the cooperation of lending institutions that participate in the Guaranteed Student Loan program, students may receive long-term educational loans which are interest-free during periods of at least half-time enrollment. Graduate students may borrow a maximum of \$7,500 per year, the amount received determined by the students' computed financial need through the FAF or GAPSFAS.

Repayment of the loan begins six months following graduation or termination of less than half-time enrollment. The minimum repayment is \$600 per year and the interest rate of 8 percent begins at the time of repayment and increases to 10 percent beginning with the fifth year of repayment.

### **College Work-Study Program**

Employment through the College Work-Study Program is available to students who demonstrate a financial need, according to federal guidelines.

Graduate students who are registered for at least four-and-a-half credit hours are eligible to work a maximum of twenty hours per week while classes are in session. Full-time summer employment is available to students who qualify for financial aid for the following fall term.

### **Short-Term Loans**

Students who have earned at least three credit hours at Wright State University are eligible for small, short-term loans for fees or for personal needs. The entire amount of the loan must be paid in full by the fifth week of the quarter in which the money is borrowed.

### **Veterans' Benefits**

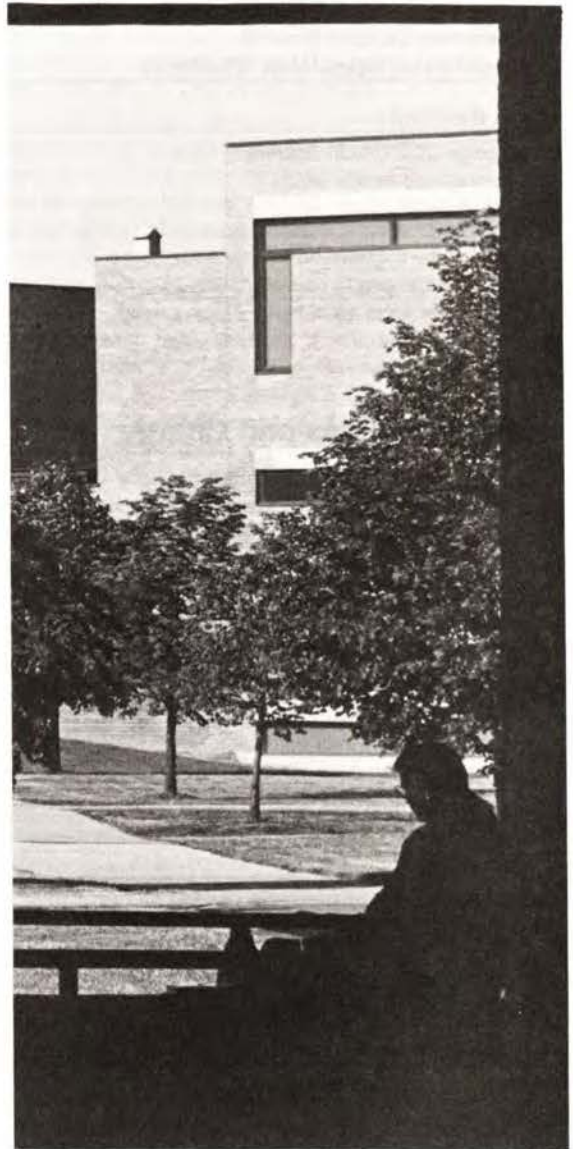
**G.I. Bill** benefits can be used by veterans and active-duty personnel who served during the post-Korean and Vietnam periods. Veterans who served on active duty for more than 180 continuous days, any part of which occurred after January 31, 1955, but before January 1, 1977, and who were released under conditions other than dishonorable, are eligible. Veterans who were released from active duty after June 1, 1966, have eligibility for ten years after their last discharge or release, or until December 31, 1989, whichever is earlier.

The **Veterans' Educational Assistance Program (VEAP)** can be used by a veteran who entered active military service after December 31,

1976, served for a continuous period of 181 days or more, and contributed to VEAP while on active duty.

The **All-Volunteer Force Educational Assistance Program** (New G.I. Bill) can be used by a veteran who entered on active duty at any time during the three-year period beginning July 1, 1985, through June 30, 1988, and paid into the program.

Applications are available from the Veterans Affairs Office at Wright State University or from any Veterans Administration office. Educational opportunities are available for children, wives, and widows of veterans whose deaths or permanent total disabilities were service-connected and for wives and children of servicemen declared missing in action or prisoners of war.



# Fees

## 1987-88 Quarterly Feest

<b>Master's Students</b>	<b>Main Campus</b>	<b>WSU Lake Campus</b>	<b>WSU Extension</b>
<b>Ohio Resident</b>			
1 through 10.5 credit hours/per hour	\$84	\$80	\$77
11 through 18 credit hours*	890	847	
<b>Nonresident</b>			
1 through 10.5 credit hours/per hour	\$151	\$147	\$134
11 through 18 credit hours*	1,598	1,555	

### Academic Doctoral and Educational Specialist Students

<b>Educational Specialist Students</b>	<b>Main Campus</b>
<b>Ohio Resident</b>	
1 through 10.5 credit hours/per hour	\$84
11 through 18 credit hours*	890
<b>Nonresident</b>	
1 through 10.5 credit hours/per hour	\$151
11 through 18 credit hours*	1,598

†Fee assessment is based on course level.

\*The hourly rate applies to all credit hours in excess of 18.

*Note:* Fees for School of Medicine and School of Professional Psychology students differ from those listed above. For these fee schedules, consult the Office of the Registrar.

## Additional Fees and Charges

Late registration fee/all students	\$25	\$25	\$25
Nondegree application fee	\$10	\$10	\$10
Application fee to change from nondegree to degree student	\$15		
Audit fee/per credit hour (laboratory and special courses not open to audit)	same as for credit courses	same as for credit courses	same as for credit courses
Drop fee per transaction	\$10	\$10	\$10
Charge for spouses and dependents taking courses under Educational Benefits Policy/per credit hour (see note below)	\$13	\$12	\$12
Transcript fee/first request	\$3	\$3	\$3
each additional at same time—\$1			
immediate preparation of transcript—\$15			
Undergraduate and graduate degree student and certification student application fee	\$25	\$25	\$25
Returned check penalty/per check	\$15	\$15	\$15
Applied music fee			
one half-hour lesson per week	\$55		
one hour lesson per week	\$110		
Proficiency test/per credit hour	\$10	\$10	\$10
Graduation fee	\$25	\$25	
International student fee	\$40		
Student's Installment Payment Plan application fee/late payment fee	\$15/\$15		
Short-Term Loan processing fee/late payment fee	\$5/\$15		



Persons interested in using the Educational Benefits Policy should contact the Department of Human Resources or consult the *Wright Way Policies/Procedures* manual for further information on fees paid under this policy.

Some courses may require additional fees to cover travel, individual instruction, or materials; check the course descriptions in this catalog and the departmental offices.

Fee schedules are subject to change depending on action by the state legislature and approval by the Ohio Board of Regents and the University Board of Trustees. The quarterly fees listed here for the main campus, WSU Lake Campus, and Wright State University Extension are those in effect when this catalog went to press. For an up-to-date list, you should consult the Office of the Registrar.

Library fines are set by the university librarian with the approval of the president.

## Paying Fees

The method for paying fees depends on which registration period is used. See the section on registration for a description of the different registration periods.

Students will find fee payment deadlines for each registration period in the university calendar published in the quarterly schedule of classes. Students who register early and do not pay the fees by the required due date will have their registration canceled in order to make classroom space available to other students. Students who register during the open registration period must pay all fees and charges at the same time they register.

Students are encouraged to pay fees by check or money order, made payable to Wright State University and sent to the attention of the bursar. The check or money order should be written for the exact amount due. Incorrect checks will be returned, and registration will proceed on schedule if a new check or money order for the correct amount is received by the published deadline date for the payment of fees. Post-dated checks will be returned to the sender.

Students may also use either MasterCard or VISA credit cards to charge most fees paid to the university. In order to use a credit card, students must either be the cardholder or have the cardholder's authorization. All charge transactions are subject to approval by the financial institution that issued the credit card.

Students have the option of using the Student Installment Payment Plan (SIPP) to spread quarterly fees for tuition, insurance, and university housing (if applicable) over a three-month period. The plan is offered as an alternative to the single payment for fees that is normally due at the beginning of fall, winter, and spring quarters. SIPP is not offered during the summer quarter. For a \$15 nonrefundable fee, preregistered students pay one-third of their

fees by the published fee payment deadline. The balance is divided into two installments which are payable at established dates about thirty days apart. Students who participate in open registration must pay the \$15 fee and the initial installment on the day they register. The second and third payments are due on the same dates established for those who have preregistered. Further information about SIPP is available at the Bursar's Office.

Payment of fees can be mailed to the attention of the bursar or presented in person at the cashier windows in Allyn Hall. Mailed payments should be sent to ensure their receipt by the fee payment deadline. Mailed payments received after the deadline will be returned and the original registration will be canceled.

Students whose fees are entirely paid by grants or scholarships must still notify the Office of the Bursar by the established fee payment deadline of their intention to attend Wright State.

Any payment made with a check not honored by the bank will result in the student's registration being canceled unless satisfactory payment arrangements are made within seven days after appropriate notification is mailed to the student. A returned check charge is assessed for each check not honored by the bank. All charges, including the returned check charge, must be paid by the date indicated in the notification.

Financial accounts may be audited at any time during students' enrollment or academic career. If an error is identified, a bill or refund will be issued. The university will issue a refund within thirty days or apply the credit to the account. If students do not make acceptable arrangements to pay any amount due within thirty days after notification, their current registration will be canceled.

## Refunds

A current schedule of refunds can be found in the quarterly schedule of classes. Refunds relating to withdrawal are initiated through the Office of the Registrar. Refunds will be calculated as of the date of official withdrawal, unless proof is submitted substantiating circumstances that were beyond the control of the student (e.g., hospital confinement) and that prevented the filing of the official withdrawal at an earlier date. In such a case, the refund will be determined as of the date of said circumstances. Nonattendance of classes or notification of the instructor or department does not constitute official withdrawal. Refunds or reduction of indebtedness for withdrawals after the official dates will not be made in cases of failure or inability to attend classes because of changes in business (e.g., work schedule) or personal affairs (e.g., illness).

Students who officially withdraw from the university before the eighth calendar day of the quarter or its summer session equivalent will receive a 100 percent refund of instructional and general fees paid.



Students who withdraw during the eighth through sixteenth calendar day of the quarter or its summer session equivalent will receive a credit based on 70 percent of the fees assessed. Students who withdraw during the 70 percent period will be charged 30 percent of the total instructional and general fees assessed, regardless of how much they have paid at the time of withdrawal. For students on the installment payment program, the charge of 30 percent of the total instructional and general fees assessed will be subtracted from their payments to determine the amount of any refund.

No refunds will be granted after the sixteenth calendar day of the quarter. Students who withdraw while owing the university money will be considered to be indebted to the university for that amount. Therefore, all refunds will be applied to any indebtedness before being issued to those students. All refunds will be issued thirty days after the date of withdrawal from the university.

Students who drop courses during a partial-refund period will receive the refund according to the published refund schedule that will be in compliance with the policy for complete withdrawal.

All refunds of fees other than instructional and general fees must be approved by the responsible office or department before submission to the Office of the Bursar (e.g., room and board refunds must be approved by the director of housing).

Appeals regarding charges and refunds of instructional fees, late registration fees, and drop fees must be submitted in writing to the Office of the Registrar. Appeal procedures are available in that office.

## Criteria for Ohio Residency

Students who are nonresidents of Ohio must pay a nonresident fee in addition to other fees and charges.

The following general rules, established by the University Board of Trustees, determine who can be considered an Ohio resident and cite specific exceptions to the general rules.

Persons in the following categories are classified as residents of the state of Ohio for subsidy and tuition surcharge purposes.

- 1 Dependent students, at least one of whose parents or legal guardian has been a resident of the state of Ohio for all other legal purposes for twelve consecutive months or more immediately preceding the enrollment of the student in an institution of higher education
- 2 Persons who have resided in Ohio for all other legal purposes for at least twelve consecutive months preceding their enrollment in an institution of higher education and who are not receiving, and have not directly or indirectly received in the preceding twelve consecutive months, financial support from persons or entities who are not residents of Ohio for all other legal purposes
- 3 Persons who reside for all legal purposes and are gainfully employed on a full-time or part-time and self-sustaining basis in Ohio and who are pursuing a part-time program of instruction at an institution of higher education
 

Criteria that may be considered in determining residency for these purposes may include, but are not limited to, the following:

  - 1 Criteria evidencing residency:
    - if a person is subject to tax liability under section 5747.02 of the Ohio Revised Code
    - if a person qualifies to vote in Ohio
    - if a person is eligible to receive Ohio state welfare benefits
    - if a person has an Ohio driver's license and/or car registration
  - 2 Criteria evidencing lack of residence:
    - if a person is a resident of or intends to be a resident of another state or nation for the purpose of tax liability, voting, receipt of welfare benefits, or student loan benefits (if the student qualified for that loan program by being a resident of that state or nation)
    - if a person is a resident or intends to be a resident of another state or nation for any purpose other than tax liability, voting, or receipt of welfare benefits

Specific exceptions and circumstances include:

  - 1 A person on active duty status in the United States military service who is stationed and resides in Ohio and his or her dependents shall be considered residents of Ohio for these purposes.
  - 2 A person who enters and currently remains upon active duty status in the United States military service while a resident of Ohio for all other legal purposes and his or her dependents shall be considered residents of Ohio for these purposes as long as Ohio remains the state of that person's domicile.
  - 3 Any alien who holds an immigration visa or is classified as a political refugee shall be considered a resident of the state of Ohio for state subsidy and tuition surcharge purposes in the same manner as any other student.
  - 4 No person who holds a student or other temporary visa shall be eligible for Ohio residency for these purposes.
  - 5 A dependent person classified as a resident of Ohio who is enrolled in an institution of higher education when his or her parents or legal guardian remove their residency from the state of Ohio shall be considered a resident of Ohio for these purposes during continuous full-time enrollment and until his or her completion of any one academic degree program.
  - 6 In determining residency of a dependent student, removal of the student's parents or legal guardian from Ohio shall not during a



period of twelve months following such removal constitute relinquishment of Ohio residency status otherwise established under this rule.

- 7 Any person once classified as a nonresident, upon the completion of twelve consecutive months of residency in Ohio for all other legal purposes, may apply to the institution he or she attends for reclassification as a resident of Ohio for these purposes. Should this person present clear and convincing proof that no part of his or her financial support is or in the preceding twelve consecutive months has been provided directly or indirectly by persons or entities who are not residents of Ohio for all other legal purposes, this person shall be reclassified as a resident. The institution may require, among other things, the submission of information regarding the sources of a student's actual support to that end.
- 8 Any reclassification of a person who was once classified as a nonresident for these purposes shall have prospective application only from the date of the reclassification.
- 9 A person who is transferred by his or her employer beyond the territorial limits of the fifty states of the United States and the District of Columbia while a resident of Ohio for all other legal purposes as long as Ohio remains the state of such person's domicile.
- 10 A person who has been employed as a migrant worker in the state of Ohio and his or her dependents shall be considered a resident for these purposes provided such person has worked in Ohio at least four months during each of the three years preceding the proposed enrollment.

## Student Services

The Office of Student Development provides general information and growth opportunities to students and student organizations through a number of programs. New student orientation introduces the university and its programs and services through workshops on numerous topics, campus tours, and small group participation.

*The Student Handbook*, written by the Student Development staff, outlines helpful information and lists university policies and procedures that govern students. The University Information Center staff in Allyn Hall answers questions on the spot and can refer students to the appropriate university offices for detailed answers to involved questions.

The Student Development staff also advises student organizations, supervises expenditures from the student activities fund, and is involved in developing policies concerning students. A special Leadership Program provides opportunities to develop leadership and communication skills through weekend experiential workshops and one-day workshops offered several times during the year.

International students attending Wright State can find answers to their questions by consulting with the international student adviser, who is a member of the Student Development staff.

On-campus communication is aided by assigning a mailbox to each student who attends classes on the main campus. Most official university correspondence is placed in these mailboxes, located in the Allyn Hall student lounge. Students are assigned a mailbox in the fall and keep the same mailbox throughout the year unless they fail to register early for winter or spring quarter.

University Placement Services provides both students and alumni with comprehensive career services. Placement advisers aid students in matching their interests, values, skills, personal assets, and career goals and objectives to a program of job search strategies. Computerized career exploration, workshops, handouts, and testing services are all examples of tools that are used in helping students define and clarify educational and career goals. Employment information concerning economic trends, employment outlook, salary ranges, job demand, and location is part of an overall program that provides career specifics to students as they plan their future employment.

Bringing students together with prospective employers is the central focus of University Placement Services. Employment opportunities are available through on-campus interviews, job listings, and referrals. In addition, undergraduate students may elect to seek employment through cooperative education.





The Psychological Services Center staff of the School of Professional Psychology helps students learn to integrate their academic and personal lives through a variety of experiences. Recognizing the need for life skills development, the center offers individual and group counseling in such areas as increasing self-esteem, assertiveness training, human sexuality, decision making, and adapting to change. Services are also available to assist students in coping with stress as it relates to school, work, family, and personal life situations. Test anxiety, fear of failure, changing values, and uncertainty about future plans are some of the commonly presented concerns.

Students who are interested in these programs or who have other personal concerns may call the Psychological Services Center for an appointment or may visit the center Monday through Friday from 8:30 am to noon and from 1 to 5 pm. All counseling services are confidential and are available to students without charge. The offices are located on the second floor of the Frederick A. White Center.

Veterans who are seeking a degree and who attend school either full time or part time may be entitled to specific benefits. The Veterans Affairs office on campus can help veterans take full advantage of these educational benefits.

Medical care is available to students in Student Health Services in Allyn Hall. Personnel are on duty to see routine health problems during normal working hours Monday through Friday. Students needing physician care will be referred to the Frederick A. White Center or to a private physician. There is a charge for this service; student insurance may cover some of this expense. Student Health Services also sponsors preventive health care programs for the university community, such as a wellness program, hearing and hypertension testing, and community services including visits from the Community Blood Center.

The Department of Public Safety is the official law enforcement agency for the university campus. Information or complaints concerning any emergency or criminal activity should be reported immediately to the public safety communication center, 121 Allyn Hall, campus telephone extension 2111.

The Office of Parking Services establishes and regulates the procedures for parking on campus. Motor vehicle regulations and complete information about parking are available at the parking services office, 044 Allyn Hall, 873-2152. The Office of Parking Services is also responsible for lost and found articles. Articles are held for ninety days and, if not claimed, are sold at an auction.



## Services for Disabled Students

Extending the opportunities of higher education to people with disabilities is a high priority at Wright State. We rank as a leader in adapted physical facilities, and campus buildings have been designed to be free of architectural barriers. Ramps and ground-level entrances lead to each building and all buildings have adapted restrooms and elevator access to every floor. An underground tunnel system links most campus buildings. Handicapped Student Services promotes the realization of each student's potential by offering services in physical, academic, personal, and/or vocational areas. These services are provided on the basis of individual need, allowing learning-disabled and physically disabled students to pursue college educations.

Physical support services are designed to enable each student to be as independent as possible and include personal attendant care for dressing and hygiene needs; adapted transportation for disabled commuter students; adapted campus parking; assistance in locating adapted off-campus housing; training in activities of daily living to achieve a greater degree of independence; campus mobility orientation for visually impaired students; and adapted athletics and intramural sports.

The academic support services are designed to assist physically and learning-disabled students in meeting all academic requirements. These include tape library services and the provision of taped textbooks for students who have a visual impairment.



or a learning disability; test proctoring for students who need reading or writing assistance and/or extra time to complete a test; and academic aids that accommodate individuals with disabilities in meeting class requirements.

The vocational program assists students in making realistic occupational choices. Opportunities exist in the planning and development of a career, and there are services designed to provide experience at various employment sites. These methods allow students to make a realistic decision about a future career and ensure that students are able to meet the demands of the occupation.

Applicants requiring services available for disabled students are strongly encouraged to contact Handicapped Student Services prior to admission to make arrangements for the necessary services.

## Facilities

### University Center

The University Center is a good place to meet and talk with students, staff, and faculty. It includes a cafeteria, private dining rooms, meeting rooms, lounges (including a TV room), a game room, box office, computer room, rathskeller, faculty dining room, offices for staff and for student organizations, and the bookstore. The student-run University Center Board (UCB) schedules videos, guest speakers, novelty entertainment, dances, and recreational tournaments at the center. The facility can also be reserved for public activities by arrangement with the University Center director's office. The Office of University and Community Events, which facilitates the planning of official university activities, is available to provide consultation on planning and coordinating special functions.

The Student Activities Office, on the lower level of the center, serves as a resource to members of the university community in planning a wide range of functions. Use of the quad, the University Center's grassy knoll, and road signs can be arranged through this office. The office also provides information about various types of entertainment and manages the University Center Box Office, where tickets for Artist Series, Contemporary Lecture Series, and other events can be purchased.

The University Bookstore is located on the lower level of the center. It stocks textbooks and tradebooks used in Wright State classes as well as a variety of other books, supplies, and gift items. The bookstore also buys and sells used books each quarter.

### Housing

Wright State University currently has three residential communities which provide campus housing for both undergraduate and graduate students. Hamilton Hall, a traditional residence hall;

The Woods, a series of suite-style residence halls; and the Forest Lane Apartments, a combination of studio and two-bedroom garden apartments, make up the three communities. Once admitted to the graduate school, all students will receive information concerning available campus housing. The Housing Office also provides a variety of services to aid students who wish to obtain off-campus housing accommodations. Additional information on both on- and off-campus housing can be obtained by contacting the Housing Office.

## Participation

### Intramurals and Athletics

When it's time to take a break from the books, the university offers several athletic alternatives. First, graduate students are encouraged to compete in the intramural programs. Active throughout the academic year, the intramural department offers numerous team sports including touch football, volleyball, indoor soccer, basketball, and softball. Leagues are developed with co-ed teams, as well as all-male and all-female teams. Individual sports include racquetball, table tennis, wrestling, golf, and tennis.

In addition to organized intramurals, open recreation periods offer a second alternative by allowing students to use the athletic facilities which include a 25-yard swimming and diving pool, two weight facilities including one with Nautilus equipment, and two gymnasias.

The intercollegiate athletic program offers a third alternative for involvement for graduate students. Although they cannot compete on intercollegiate teams, graduate students are admitted free to all athletic contests. An NCAA Division I participant since the fall of 1987, Wright State offers fifteen NCAA-sponsored sports plus wheelchair athletics. Men's basketball has become the signature sport at Wright State, advancing to the NCAA tournament eight times in the Division II years and winning the 1983 national championship.

However, Wright State is far from a one-sport athletic program. The baseball, women's basketball, volleyball, and golf teams have qualified for NCAA postseason play. The men's and women's swim teams, wrestling squad, and men's cross country teams have placed in the top ten at Division II national championships. Wheelchair athletes compete in the Central Intercollegiate Conference with basketball as their primary sport, although Wright State athletes also compete in track and swimming.





## Organizations and Activities

Many opportunities for extracurricular involvement exist through participation in student organizations, clubs, and activities. Several academic departments sponsor departmental clubs and honoraries. Sixteen chapters of Greek letter fraternities and sororities offer service, social activities, and friendship. Sports, religious, and special-interest clubs provide many avenues for exploring your interest with a group.

University Center Board (UCB), the campus programming organization, sponsors a variety of entertainment activities for students including concerts, movies, special events, and recreational outings. In cooperation with Inter Club Council (ICC), an umbrella organization composed of representatives from over seventy-five clubs, UCB presents October Daze and May Daze, which give the student organizations a chance to recruit new members and plan money-making projects.

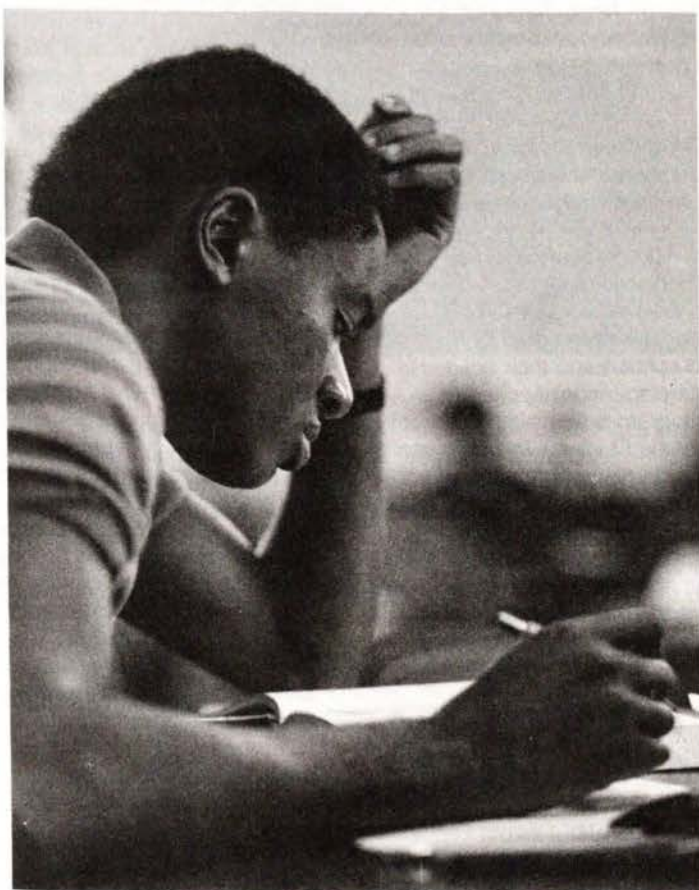
For students who wish to put their creative talent to work, there are several student media outlets on campus. The student newspaper, *The Daily Guardian*, which utilizes editors, writers, proofreaders, salespeople, and photographers, is published four times a week during the academic

year. The literary magazine *Nexus* comes out three times a year and includes writing and original artwork from members of the university community. WSU Cablevision, a student-run cable station, provides classroom training and experience in video production as well as programming for cablecasting throughout the Dayton area. Students can also work on and off the air at the student-run campus radio station, WWSU-FM.

Many cultural opportunities on campus allow students both to see and to participate in the performing arts. The Department of Music presents many concerts and recitals by student and faculty soloists and choral and instrumental groups. University Theatre presents several major productions, several one-act plays, and at least one children's theatre production during the academic year. The Department of Theatre Arts has also offered a motion picture series and the University Center Board sponsors many current popular films, concerts, speakers, and cultural events. The Contemporary Lecture Series brings notable speakers to campus throughout the year. The University Art Galleries regularly schedule exhibitions and events, both in the Main Gallery and the Experimental Gallery. The University Artist Series arranges visits by nationally known artists.

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## THE SCHOOL OF GRADUATE STUDIES





The School of Graduate Studies had a total enrollment of 3,229 in the fall quarter of 1987, 80 percent of whom were part-time students. In addition, 482 students were enrolled in the Schools of Medicine and Professional Psychology. Master's degrees are awarded through the School of Graduate Studies and the departments offering graduate programs. The graduate school offers twenty-seven master's degree programs and one post-master's degree program through the Colleges of Business and Administration, Education and Human Services, Engineering and Computer Science, Liberal Arts, Science and Mathematics, and the School of Nursing. Doctoral degrees are offered through the College of Science and Mathematics, the School of Medicine, and the School of Professional Psychology. Beginning fall quarter 1985, Wright State's College of Education and Human Services began offering the Ph.D. in educational administration and supervision, in cooperation with Bowling Green State University, and the Ed.D. in school administration and in counselor education, in cooperation with Indiana University.

In addition to granting graduate degrees, the School of Graduate Studies is responsible for the administration of all graduate programs in the university, a task it shares with the discipline-focused colleges and schools and their academic departments. (The interdisciplinary Applied Behavioral Science program is administered directly by the School of Graduate Studies.) The graduate school also helps develop new programs and maintains appropriate standards for graduate-level programs. The administrative services of the school are provided by the graduate school office, consisting of the dean and vice-president for research, the assistant dean and director of graduate admissions and records, and their staff.

## Graduate Policy/ Instruction

### The Graduate Council

The Graduate Council is comprised of deans, elected representatives, and alternates from each of the five colleges and the School of Medicine, the School of Nursing, the School of Professional Psychology, the Biomedical Sciences Ph.D. Program, and one graduate student. The council is the graduate school's policy-making body, which acts for the graduate faculty and is chaired by the dean of the School of Graduate Studies.

The council's functions include developing university policies and procedures for graduate studies, recommending to the president and Board of Trustees the approval of new graduate degrees and programs, and establishing standards for the graduate faculty. The council regulates student

admission, registration, academic requirements, and other procedures regarding graduate study. It provides the central planning required to promote programs of the highest quality and evaluates proposals for new graduate programs and major revisions of existing programs.

### Graduate Faculty

The graduate faculty, the body primarily responsible for graduate study, is comprised of faculty members whose experience and records of scholarship qualify them to offer graduate-level instruction. The graduate faculty's purpose is to encourage and contribute to the advancement of knowledge through instruction and research of the highest quality. It is responsible for student advising and supervising student research and graduate assistants. Emphasis is placed on the totality of a graduate faculty member's instructional, advising, and professional responsibilities as well as explicit scholarship criteria.

## Graduate Students/ Representation

Student Government, the elected representative student assembly, represents the interest of the student body on the Academic and Graduate Councils, communicates with the student body on matters of policy, appoints students to university committees, and researches matters of interest to the student body. Student Government includes a representative from the School of Graduate Studies and one each from the Schools of Medicine and Professional Psychology. Student representatives also serve on several Graduate Council Committees.

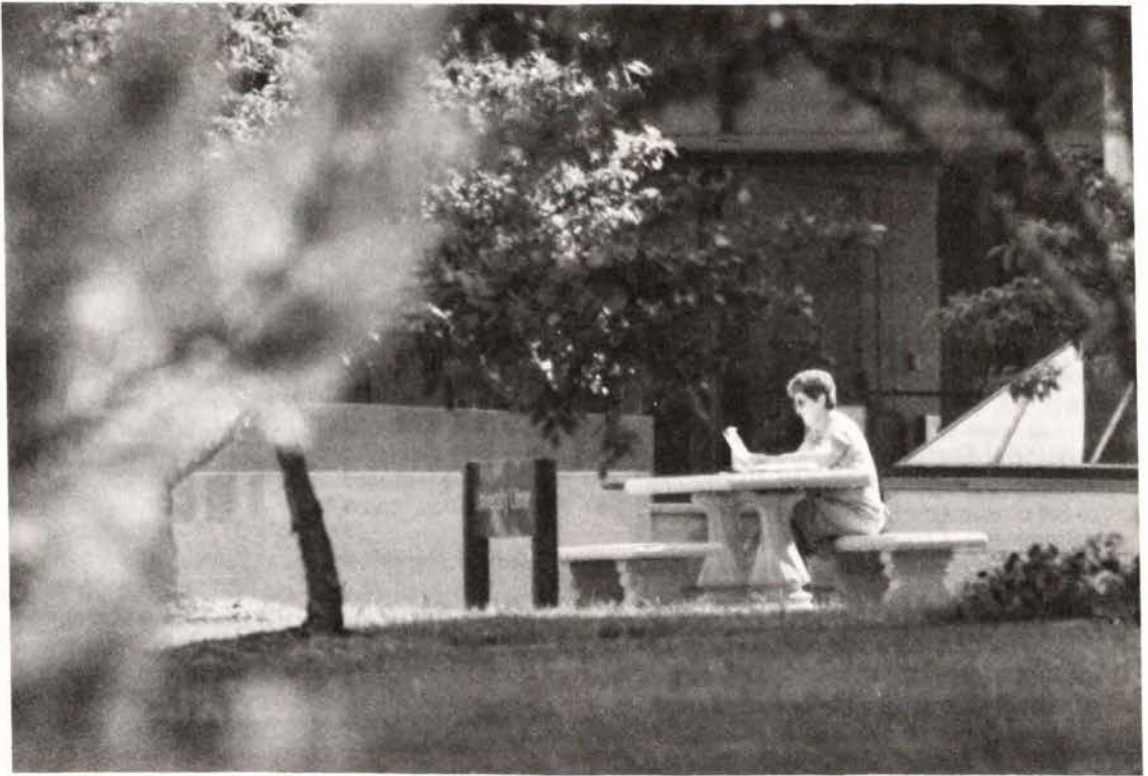
Students who do not know where to take a grievance, problem, or suggestion can go to the Office of the Ombudsman. The ombudsman provides accurate information about the university, investigates and tries to resolve student problems, and makes students' concerns known to the faculty and administration.

## Research

A prime objective of the School of Graduate Studies is to advance scholarship in all forms. There is a close association between graduate study and research, since many graduate programs aim specifically toward education for research. Even those programs that aim toward professional practice more than research require an education that enables persons to apply the results of research in their professional work.

The term "research" is used here to include scholarly efforts of many kinds. It includes work in the laboratory, the library, and the field. The various





kinds of research and scholarship include laboratory and field experiments, correlation studies, naturalistic observations, economic research, historical and other documentary studies, and the creative endeavors of the arts. The graduate school is obligated to aid and encourage all forms of scholarly efforts by the graduate faculty and graduate students.

The university's Research Council is responsible for institutional research policy. The council is made up of elected representatives of the faculty, the administration, and the dean of graduate studies.

The Office of Research and Sponsored Programs aids faculty and students in finding sources of funding for research and in preparing proposals. This office serves as a liaison with federal, state, and local sources for the support of research and scholarly activity. The office's staff provides assistance upon request.

*Research News*, a publication of the Office of Research and Sponsored Programs, is an excellent source of information on research currently being carried out in the university and potential sources of funding. It is available upon request.

The university's Institutional Review Board reports to the dean of the graduate school and monitors all research projects involving human subjects. The committee is responsible for ensuring the ethical and proper treatment of human subjects. All projects utilizing human subjects must be reviewed in advance by this committee.

It is important that graduate students working in a program that includes education for research carefully assess their research interests and needs for research experience. They should contact interested faculty members who will advise and work with them in these efforts, and then begin their research work at the earliest possible time. Graduate students should discuss this with the department chair or dean shortly after beginning graduate study.

## Admission

Students must be officially accepted for admission to the School of Graduate Studies before they may register for graduate credit.

All correspondence pertaining to the admission of a student should be addressed to the School of Graduate Studies, Wright State University, Dayton, Ohio 45435. The School of Graduate Studies will coordinate the processing of the application.

Applications for admission and supporting credentials should be received at least three weeks before registration for the quarter in which the student wishes to begin graduate study.

All documents received by the university in connection with an application for admission become the property of Wright State University. Under no circumstances will they be returned to applicants or forwarded to any agency or other college or university.



Admission to the School of Graduate Studies does not necessarily indicate candidacy for an advanced degree. Such candidacy is subject to specific requirements as defined by the individual programs.

Students are identified by the School of Graduate Studies as being in one of the following categories.

## Degree-Seeking Students

### Regular Status

The student is admitted as fully qualified to pursue a program leading toward a graduate degree.

### Provisional Status

Under certain conditions, a student may be admitted provisionally (for one quarter only), pending receipt of credentials. If admission requirements are not met during the quarter in which a student has been admitted provisionally, registration for future quarters will be denied.

### Conditional Status

The student is admitted in this category to a graduate program under certain conditions. Graduate credit earned while in this status will apply toward degree requirements. If all admission requirements are satisfied and the student has completed the first twelve credit hours of graduate work, after being admitted in this status, with a 3.0 (a grade equivalent of B) cumulative grade point average, regular status will be granted upon approval of his/her graduate program. A student in this category who does not meet these conditions will be dismissed from the School of Graduate Studies.

## Other Admission Categories

### Nondegree Status

A student qualified for admission who does not plan to work toward a degree may be admitted on a nondegree basis for selected graduate courses. A student cannot become a degree candidate while in this status. Subject to subsequent acceptance into a degree program and provided the credits are acceptable to the department/college, a maximum of twelve credit hours may be applied toward a graduate degree. A student in this status must maintain a 3.0 grade point average.

### Certification Status

Students who wish to complete certification requirements at the graduate level but do not wish to pursue a graduate degree may be admitted as certification candidates.

### Senior Permission

Seniors at Wright State who have completed 162 credit hours toward the baccalaureate degree and have earned a cumulative grade point average of 3.0 may apply for permission to elect specified graduate courses for graduate credit. Approval must be granted by these students' undergraduate adviser, the chair of the department in which graduate credit is being sought, and the School of Graduate Studies.

### Special Undergraduate Status

Undergraduate students may enroll in a graduate course and apply that credit to their undergraduate programs only if they meet the following conditions: (1) have accrued 126 credit hours or more; (2) have a minimum cumulative grade point average of 2.7 or higher; (3) have a minimum cumulative grade point average of 3.0 or higher in their major; and (4) have permission granted by the instructor, the chair of the department offering the course, and the School of Graduate Studies.

### Special Status

Students who have a bachelor's degree may enroll in certain workshop courses for graduate credit without being admitted to the graduate school. If they are appropriate, a limited number of such credits may be applied later to a degree program.

### Transient Students

Students actively pursuing a graduate program at another college or university who wish to earn credits for transfer to that institution may be admitted for one quarter. Transient students will normally not be required to submit official transcripts. Students must complete the admission application and request the dean of their graduate school to complete the Wright State transient form indicating they are in good standing.







## International Students

Wright State welcomes applications from qualified international students. Approximately 250 students on F-1 visas currently attend the university. Application materials may be requested from the admissions office. Applications for admission must be completed one quarter prior to the quarter in which the applicant wishes to begin studies at Wright State; applications for fall quarter must be completed by the end of May.

Graduate international applicants are expected to meet the following criteria for admission:

- 1 Graduate applicants must have earned a baccalaureate degree or its equivalent from an accredited college, university, or other institution of higher learning. Only an official transcript, translated into English, will be accepted as evidence of academic preparation. If the credentials cannot be evaluated by the Office of International Admissions, the applicant will be required to submit the credentials to an evaluation service and pay the cost of the evaluation.
- 2 All international applicants must demonstrate proficiency in English. If the applicant's native language is not English, a minimum score of 500 on the Test of English as a Foreign Language (TOEFL) is required. (Students applying to the master's degree program in English must score 600 or better and meet additional requirements. See the program description for English.) In addition, students other than transfer students will be required to take a university-administered English placement test prior to registering for classes. Students failing this test will be required to take supplemental on-campus classes to strengthen their English skills.
- 3 Since the only type of internal financial assistance available to international graduate students is in the form of graduate assistantships, the university must be assured that all international applicants have adequate financial resources to attend Wright State. If the applicant is being sponsored, the financial statement form must be accompanied by an affidavit of support and a bank statement provided by the sponsor, indicating the amount of money available to the applicant for the purpose of studying at Wright State University. Assistantships to first-year international students are granted by exception only, with the approval of the dean of the School of Graduate Studies. In addition to meeting the standard English requirements, graduate teaching assistant (GTA) applicants must score 250 or higher on the Test of Spoken English (TSE) before they will be assigned to classroom duties. The TSE should be taken at least one year preceding the GTA appointment; however, students who have not taken the TSE prior to arrival at Wright State will have the opportunity to take the institutional TSE on campus. Those applicants financing their own education from personal funds must also submit a bank statement together with the financial statement. Bank statements are to be sent by the bank directly to the Office of International Admissions. Wright State University reserves the right to require prepayment equivalent to one year's expenses.
- 4 Form I-20 will be issued by the international student adviser when the applicant has met the above requirements and has been admitted to the university.
- 5 International students already in the United States who wish to transfer from another university will not be considered for admission if they are not currently in status according to the Immigration and Naturalization Service. Transfer students must present evidence of above-average ability to do college work.

## Requirements for Admission

- 1 Complete an application form.
- 2 Pay a nonrefundable application fee.
- 3 Have an earned bachelor's degree from an accredited college or university.
- 4 Submit one official transcript of all previous college work (undergraduate and graduate). If courses from one university or college appear on another university's or college's transcript,



## 32 The School of Graduate Studies

the applicant is still required to submit an official transcript from the university or college where the course was taken. An applicant should request the registrars of all colleges previously attended to send one official transcript directly to the School of Graduate Studies. (Note: If the applicant is applying for nondegree status only and he or she holds a master's degree or higher degree from an accredited college or university, then only proof of the highest degree is needed.)

- 5 Meet the minimum requirements for the appropriate admission category.

*Regular Status* An overall undergraduate grade point average of 2.7 (based on a 4.0 grading system) or an overall undergraduate grade point average of 2.5, but with a 3.0 or better for the last ninety-three quarter hours (sixty semester hours) earned toward the undergraduate degree.

*Conditional Status* An undergraduate grade point average of less than 2.7 but above 2.5 (based on a 4.0 grading system) or an undergraduate grade point average of less than 2.5 but above a 2.3 if the grades in the last half of undergraduate work constitute a 2.7 or better.

*Nondegree and Certification Status* An undergraduate grade point average of 2.3 or better.

- 6 Submit admission test scores, if applicable. (See the following section for test requirements.)
- 7 Students who have taken graduate courses prior to seeking graduate admission to Wright State University must have an overall graduate grade point average of 3.0 or better and must be in good standing (not holding probationary, conditional, or equivalent status) at all previously attended colleges or universities.
- 8 To be a degree-seeking student, a candidate must be admitted to a department and college/school for an identified program of study, as well as be admitted to the School of Graduate Studies.
- 9 For international student requirements, see the previous section.
- 10 *Admission by Petition* An applicant who does not meet minimum requirements for admission, who has been dismissed from a program, or who has been denied admission to a program may submit a petition to the School of Graduate Studies for review. The petition form may be obtained from the School of Graduate Studies. The petition must contain supporting documentation of why any requirement should be waived. Submission of test grades, such as the Graduate Record Examinations and/or the Miller Analogies Test, may be required by the applicant's prospective graduate program in instances where the applicant has a grade point average below the minimum required for

admission. Applicants should contact their graduate program officer for further details. The petition is submitted for review to the petitioner's proposed graduate program, and it, along with the program's recommendation, will then be reviewed by the dean of the School of Graduate Studies, who will make the decision.

Individual departments and colleges/schools may have requirements over and above those of the School of Graduate Studies. Candidates should consult the specific requirements set forth by the department and college/school. (See program descriptions in this catalog.)

## Admission Test Requirements

### Graduate Management Admission Test (GMAT)

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Each applicant for admission to the Master of Business Administration program or the Master of Science in logistics management program, regardless of previous academic record, must submit satisfactory scores on the Graduate Management Admission Test (formerly Admission Test for Graduate Study in Business) before admission will be considered. Preregistration directly with the Educational Testing Service is required several weeks in advance of test dates. Registration forms may be obtained from the University Division, the graduate school, or the testing service.

### Miller Analogies Test (MAT)

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Applicants for admission to the College of Education and Human Services must submit satisfactory scores on either the Miller Analogies Test (MAT) or the Graduate Record Examinations (GRE). Information concerning the MAT may be obtained from the University Division or the School of Graduate Studies.

### Graduate Record Examinations (GRE)

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Applicants for admission to certain programs, under particular circumstances, may be required to submit scores on the aptitude and advanced portions of the Graduate Record Examinations (GRE). The GRE consists of two parts: the aptitude test, which contains verbal, analytical, and quantitative portions, and the advanced tests, which assess achievement in the student's major field. Students will be advised by the School of Graduate Studies when the GRE is required as an additional admission requirement.

Graduate Record Examinations, for which fees are charged, are scheduled throughout the United States in January, February, April, June, October, and December. Preregistration directly with the Educational Testing Service is required several weeks in advance of test dates. Information and registration forms may be obtained from the University Division, the graduate school, or the testing service.



Applicants will be advised concerning GRE test requirements following a review of their admission files.

Students with visual or upper extremity impairments who wish to take the GRE should follow the directions outlined in the GRE brochure, which is available in the University Division, from the graduate school, or directly from the testing service.

## Readmission

A student or applicant who falls into one of these categories must reapply for admission:

- 1 An applicant who has previously been admitted to the university but did not enroll for the quarter admitted (have file updated)
- 2 A graduate student at Wright State who was accepted for one degree program and wishes to apply for another program or degree
- 3 A graduate student who has not registered for four consecutive quarters
- 4 A graduate student who has completed the degree requirements for which he or she was originally admitted

## Registration

Students must be admitted to the School of Graduate Studies in order to register for and earn graduate credit. However, students granted special status are permitted to register for workshop courses for graduate credit.

## Procedures

### Initial Registration

Upon completion of the admission requirements and acceptance by the School of Graduate Studies, students are mailed registration materials.

The following are exceptions to this mailing:

- 1 Students admitted to the Biomedical Sciences Ph.D. program will be given registration materials during the fall quarter program orientation period.
- 2 Students admitted to the Geological Sciences program will receive their registration materials at the orientation meeting in the geological sciences department prior to fall quarter.
- 3 Students admitted to the M.B.A. program and the M.S. programs in social and applied economics and logistics management are advised in their admission letter that they must contact an adviser for an appointment to complete a Program of Study form. Subsequent to this advising session, the adviser will provide students with registration materials and assist in the selection of classes.

Registration must be completed by the date indicated in the quarterly schedule of classes. Fee statements and confirmation of registration will be mailed to students and fees must be paid before the date scheduled.

During the second week of classes, students may register only with the approval of the instructor, department chair, and the School of Graduate Studies. No registration will be accepted after the second week of classes. No students will be permitted to attend classes for which they are not properly registered.

### Subsequent Registration

Students who have registered for classes at Wright State University for any of the four preceding quarters will receive registration forms for the current quarter. Students who have not registered during the preceding year must reapply to the School of Graduate Studies to have their files updated.

### Change in Courses

No change in registration is made until the drop and add form has been accepted by the Office of the Registrar and the fee for dropping or changing classes has been paid.

Course additions must be completed by the end of the first week of the quarter. There is no fee for adding courses, although instructional and general fees are charged when applicable.

### Auditing Courses

If class space permits, students admitted to the School of Graduate Studies may audit a course with written approval from the instructor before they enroll. The amount of participation required of auditing students is left to the discretion of the instructor, but it cannot exceed that required of regular students. Audited courses may not be used to establish full-time status, and students may not change their registration from audit to credit or from credit to audit after the first week of class.

### Withdrawal from Courses

Students may drop a course or withdraw from the university without a grade through the third week of class. From the fourth week through the eighth week, a grade of W is assigned and appears on students' transcript for each course dropped. Students may not drop a course or withdraw from the university after the eighth week of the quarter.

Students who stop attending a course and do not officially withdraw receive a grade of F or X for the course.

### Course Repeat

Graduate students may repeat once any course previously taken for credit in which the grade received was below a B.





Only the hours and grade points earned from the repeated course will be included in the computing of the grade point average and meeting degree requirements.

Whenever a course is repeated under these terms, the student must so specify at the time of registration.

This procedure is acceptable only twice in any given master's degree program.

### Continuing Registration

Students who have completed all requirements for a graduate degree in the quarter prior to submission of an application for graduation need not be registered during the quarter of graduation.

Students who have not completed all required courses (including thesis defense and submission) in the quarter of graduation will be required to register for at least one hour of graduate credit. Courses in each department are reserved for continuing registration credit as follows: 789 for master's degree candidates; 899 for post-master's and doctoral candidates. The quarter in which the successful defense of the thesis is accomplished constitutes the last quarter of continuing registration. The department notifies the School of Graduate Studies by memorandum when the defense has been completed.

Any exception must be approved by the student's adviser, the department chair, and the dean of the School of Graduate Studies.

### Petition Procedure

Students who wish to deviate from the normal graduate school regulations and procedures may submit a petition to the School of Graduate Studies.

Petition forms are available in the graduate school. These students should include all supporting documents and must have the recommendation of the adviser, the instructor (if applicable), and the appropriate department or college. The completed form should be returned to the School of Graduate Studies office.

An action taken on petitions will not be considered as a precedent for any future action.

### Change of Program

Students who wish to change from one degree program to another must have the approval of the departments concerned as well as the graduate school.

Program changes within the College of Education and Human Services may be initiated by submitting a change of program form available in the student services office in the College of Education and Human Services or the graduate school office. Approval is granted by the College of Education and Human Services and the School of Graduate Studies.

Students admitted to the M.B.A. program in the College of Business and Administration who wish to change their programs must submit a change of program form to the director of the M.B.A. program. Approval is granted by both the College of Business and Administration and the School of Graduate Studies.

All other requests for change of program must be processed by completing an application for admission to the graduate admissions office. The application and supporting documentation will be forwarded to and reviewed by the department concerned. The graduate admissions office will notify the student of the admission decision.

### The Grading System

Academic achievement is indicated by the following letter grades and points used in calculating grade point averages.

- A Highest quality/4 points per credit hour
- B Second quality/3 points per credit hour
- C Third quality/2 points per credit hour
- D Lowest quality/1 point per credit hour
- F Failure/0 points
- X Failure to complete a course for which registered, without officially withdrawing/0 points (figured as an F in the grade point average)

The following symbols appear on the record, but are not included in calculating grade point averages.

- L Audit; given only if arranged for at time of registration.



- N No report; instructor did not report grade.
- P Passing; given only for specifically approved courses.
- S Satisfactory progress; a permanent grade will be assigned upon completion of the project.
- U Unsatisfactory performance.
- I Incomplete; given only when part of required work is missing and arrangements have been made with the instructor to complete the work. An agreement for the grade of incomplete must be signed and submitted by the instructor at the time the grade sheet is submitted. If the work is not completed by the end of the date agreed upon, the I grade automatically becomes an F, unless the instructor submits another I grade. An asterisk will appear next to an I grade on the grade report to indicate that the I will be changed to an F if the incomplete is not made up within the specified time. The maximum time allowed for the make up of an incomplete is the last day of class of the following quarter, except for spring quarter; spring quarter incompletes must be made up by the last day of class of the fall quarter.
- W Withdrew; given for courses from which the student withdrew or dropped during the fourth through eighth weeks of classes or equivalent or for which the student petitioned for withdrawal.

Grade reports are sent at the end of each quarter to the addresses on file in the registrar's office.

Students and graduates who think an error has been made in the recording of a grade, either on the grade report or on the official transcript, must notify the Office of the Registrar before the end of the following quarter. Students have until the end of the fall quarter to challenge a grade received for the previous spring quarter.

## Graduate Credit

### Credit Hour Limits

The maximum number of credit hours for which graduate students may register in a quarter is sixteen. In a summer term of five weeks, nine hours is a maximum.

Students holding graduate assistantships must register for a minimum of eight quarter hours of graduate credit during each quarter they hold the appointment. Predoctoral fellows are required to register for a minimum of twelve credit hours.

Students who wish to deviate from the normal registration loads listed above must have the approval of the program adviser and the School of Graduate Studies.

A graduate student who is employed full time should normally register for no more than two courses per quarter. This should be determined by the student and the faculty adviser based on such

factors as the student's employment and its effect on the student's energy and mental alertness, the student's previous academic records, and the nature of the course taken.

## Categories of Graduate Credit

### Workshops and In-Service Courses

All students who have completed the graduate admission requirements may take workshop and in-service courses.

In addition, students granted special status by the School of Graduate Studies are permitted to take workshop courses for graduate credit *without being admitted* to the School of Graduate Studies.

### Transfer Credit

Upon the recommendation of the student's adviser and the approval of the department/college concerned and the graduate school, graduate credit completed at another graduate school may be transferred to the student's master's degree program at Wright State.

Credit may be transferred if the following conditions are met:

- 1 The student is in good standing at the other institution.
- 2 The grades in the courses to be transferred are B or better.
- 3 The credit is within the five-year time limit for completing a master's degree.
- 4 The number of hours to be transferred does not exceed twelve.
- 5 An official transcript reflecting the course work is on file in the School of Graduate Studies.

The student must have been registered for a minimum of one quarter in the School of Graduate Studies before transfer credit may be reviewed.

### Credit by Examination

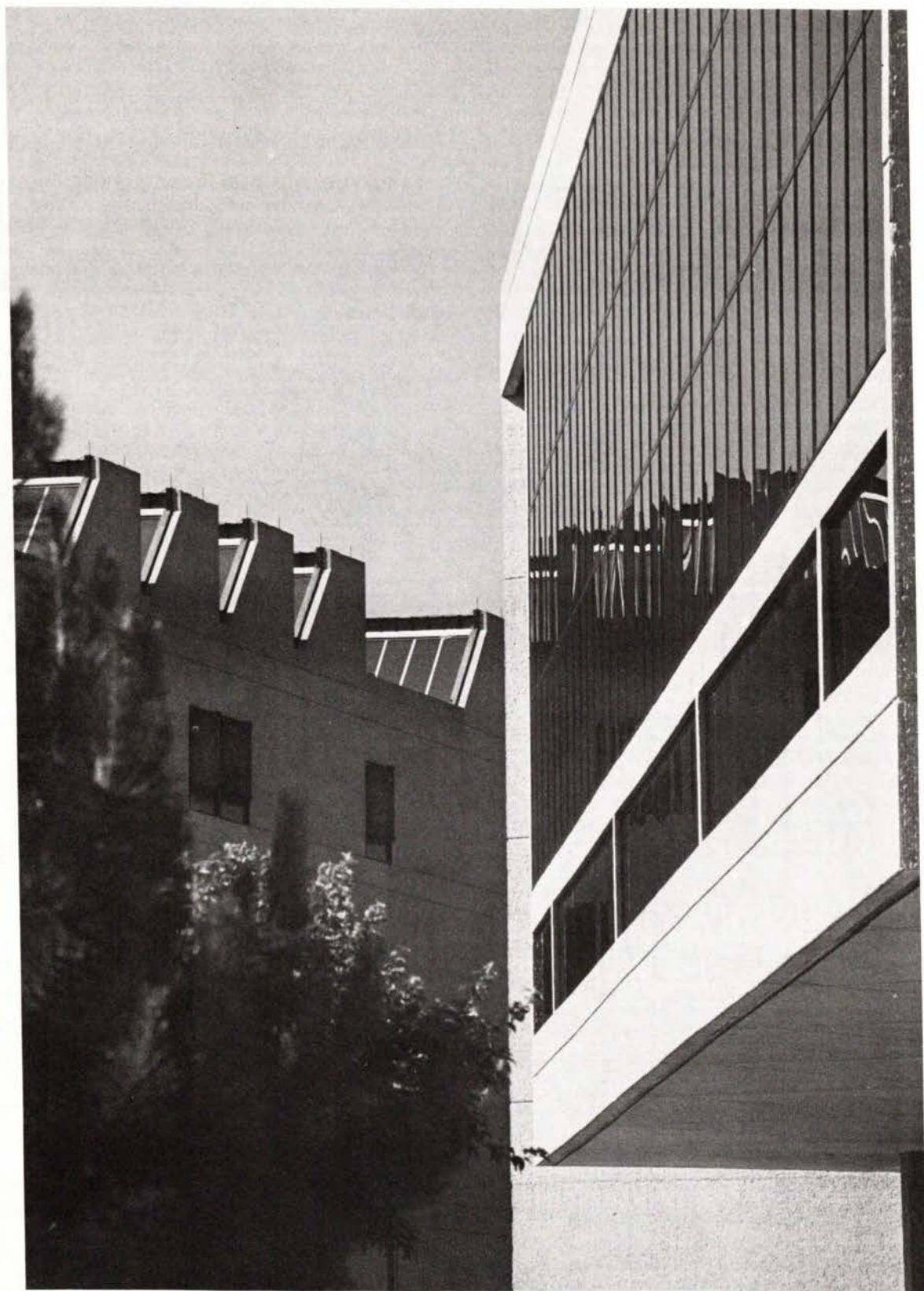
Graduate students may earn graduate credit in specific courses by demonstrating their ability on proficiency examinations administered by the respective departments.

Interested students must obtain the approval of the program adviser and the department administering the examination.

Proficiency Examination Certification forms may be obtained from the registrar's office before taking the examination. Signatures of the examiner and the department chair are required to indicate successful completion of the examination.

The completed form is presented to the bursar's office with a payment of \$10 per credit hour. Students must return the form to the registrar for posting to their permanent record.







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## GRADUATE DEGREES





### Master's Degrees

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#### **Master of Arts**

Applied Behavioral Science, Classroom Teacher, Counseling, Educational Leadership, English, History, Selected Graduate Studies, Student Personnel Services

#### **Master of Art Therapy**

#### **Master of Business Administration**

Accountancy, Finance, Financial Administration, Health Care Management, Logistics Management, Management, Management Science, Marketing

#### **Master of Education**

Classroom Teacher, Educational Leadership, Student Personnel Services

#### **Master of Humanities**

#### **Master of Music**

Music Education

#### **Master of Rehabilitation Counseling**

Chemical Dependency, Severely Disabled

#### **Master of Science**

Aerospace Medicine, Biology, Chemistry, Computer Science, Counseling, Geological Sciences, Logistics Management, Mathematics, Nursing, Physics, Selected Graduate Studies, Social and Applied Economics, Systems Engineering

#### **Master of Science in Computer Engineering**

#### **Master of Science in Teaching**

Earth Science, Physics

#### **Educational Specialist Degree**

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#### **Educational Specialist**

Curriculum and Instruction, Superintendency

### Doctoral Degrees

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#### **Doctor of Philosophy**

Biomedical Sciences, Computer Science and Engineering

#### **Doctor of Psychology**

Contact the School of Professional Psychology for information.

#### **Doctor of Medicine**

Contact the School of Medicine for information.

#### **Doctoral Degrees in Cooperation with Other Universities**

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#### **Doctor of Philosophy**

Educational Administration and Supervision (in cooperation with Bowling Green State University); Doctor of Education, School Administration (both in cooperation with Indiana University)



## The Master's Degree

### General Requirements

A student's program of study is administered by the department or college/school and is subject to approval by the School of Graduate Studies. Since program requirements vary by department and college/school, it is important for students to become acquainted with these specific requirements since they, as well as university requirements, must be satisfied. The following description covers the graduate school requirements and serves as a general guide.

### Program of Study

Certain graduate programs have opted to use the Program of Study form. The Program of Study form defines a program that is contracted between students and the graduate program. The graduate program specifically indicates that it will recommend awarding the degree sought by these students if the work contracted for is satisfactorily completed. Similarly, students specifically agree to their responsibility for completing the program. The Program of Study form is subject to modification as students progress, but all changes must have the adviser's approval.



## Advising

When students with a degree objective are admitted to graduate studies, they are assigned departmental advisers who counsel them regarding their objectives. The full degree program should be formulated with the major adviser and approved by the advisory committee and the dean of the School of Graduate Studies. Students obtain constant guidance from their advisers, examining or thesis committees, and major departments.

## Credit Hour Requirement

All master's degree programs at the university require completion of forty-five or more credit hours of graduate course work. A department may require completion of more than forty-five credit hours. Please consult requirements for a specific degree and major area.

## Residence Requirements

Students are considered to be in residence whenever they are registered on campus as graduate students. A minimum residence of three quarters at Wright State University, devoted wholly or partly to graduate work, is required. In addition, completion of a minimum of thirty-three credit hours toward the master's degree must be completed at Wright State.

## Retroactive Graduate Credit

Under the rules of the Graduate Council students must be admitted to the School of Graduate Studies in order to receive graduate credit.

Therefore, students earning workshop credits under Special Student Status (i.e., not admitted to the School of Graduate Studies) should not expect that credit earned before admission to the School of Graduate Studies will be counted at a later date toward a graduate degree. Graduate credit cannot be given for courses completed in order to qualify students for admission to graduate standing.

## Grade Standards

All students in graduate study programs are expected to maintain a minimum grade point average of 3.0. The grade of C is the minimum passing grade for graduate credit. However, no more than nine credit hours of C may be applied toward a master's degree. The attainment of a large proportion of C grades, even when balanced by A's, can be considered by the faculty as unsatisfactory course work. A course taken for graduate credit in which a D is received may not be used to meet the minimum credit hour requirements for a graduate degree.

An average of 3.0 is required for graduation in any graduate degree program. It should be emphasized that the successful completion of a required number of courses is not sufficient, of itself,

to earn a master's degree. Students must also receive the recommendation of the departmental faculty after an evaluation based upon total performance.

## Student Evaluation

At the end of twelve credit hours of graduate work, a student's grade point average will be reviewed by the graduate school. Based on this review, a student who has a cumulative grade point average less than 3.0 may be placed on probation or dismissed from the School of Graduate Studies.

At the completion of one year of graduate work or twenty-four credit hours, whichever comes first, each student will be evaluated by the departmental faculty. This evaluation will be based upon performance in courses, research, and seminars and will be forwarded to the graduate dean. On the basis of this evaluation, a student will be: (1) recommended for continuance in the graduate program; (2) placed on probationary status; or (3) required to discontinue graduate study at this university.

## Probationary Status

A student placed on probation will be required to change this status by achieving a cumulative grade point average of 3.0 within the completion of the next twelve quarter hours of credit work. Failure to achieve the 3.0 grade point average will result in the student's dismissal from the School of Graduate Studies. If a portion of these credits is in research for the thesis requirement, the student's major department must certify the student's eligibility to continue studies at the university.

## Thesis

Certain programs specify the presentation of a thesis as a requirement for the master's degree. Students completing this requirement should secure a copy of *A Handbook for Graduate Theses and Dissertations*, published by the School of Graduate Studies and available in the graduate office. The requirements outlined in this manual are basic minimal criteria that have been approved by the Graduate Council for preparing the thesis. Students should seek the advice of their thesis directors and departments for further details. Students are encouraged, but not required, to obtain a format check prior to the final deposit of their thesis. This format check significantly reduces the likelihood of a last-minute rejection. The School of Graduate Studies requires two working days to perform a format check.

The topic of the thesis should come from the student's personal exploration in his or her major or minor field. The formal petition for approval of the thesis topic must clearly set forth the problem, the intended organization, and the methods of development of the thesis. The thesis topic must be approved by the student's adviser and committee.



Students working on the approved topic for the master's thesis are required to register for a course number 799 or 899 as designated by the department.

One unbound copy of the thesis, in prescribed form, is to be taken to the graduate office no later than thirty days after the date the degree was granted. (The due dates are published by the graduate school and distributed to the departments and program offices.) The thesis copy submitted to the graduate school is sent to the library, where a microfilm copy of it is made. The microfilm copy is considered an archival copy and is deposited in the university's closed stacks in the library. The thesis copy is made available for circulation in the library. Since some departments require additional thesis copies, students should consult their advisers to determine the total number of copies needed.

### Final Examinations

Some departments require a final comprehensive examination to test the candidate's mastery of the course of study pursued. It may be written or oral, or both, at the option of the examining committee.

Candidates for a degree requiring a thesis will have written and/or oral examinations conducted by the major committee subsequent to the submission and approval of the thesis.

Arrangements for taking the examinations should be made with the candidate's adviser and the department at least three weeks in advance.

### Time Limit

Students must complete all requirements for a master's degree within five years. The time limit is from the beginning date of the earliest course of the last forty-five credit hours applied toward the degree. The time does not include a leave of absence granted for adequate cause.

### Second Master's Degree

A second master's degree may be earned by taking a minimum of thirty-three credit hours beyond the first master's degree. These hours must be taken at Wright State University. Departments or programs may specify additional requirements depending upon the length of the program, prerequisites for the individual student, and/or the nature of the first degree. Admission policies and procedures are the same as those for any student applying to the program, except that an application fee is not required if the first degree was earned at Wright State.

### Application for Degree

The university has established the following filing periods for submitting applications for degrees, based on anticipated date of completion (indicated in parentheses).

May 15 to August 21 (December)

November 1 to December 7 (March)

February 1 to March 1 (June)

April 25 to May 25 (August)

Applications for graduation may be obtained in the registrar's office. A fee of \$25 must be paid to the bursar, then the completed application should be returned to the registrar's office.

If the degree requirements are not completed at the time specified, another application (no fee), which will replace any previously submitted, must be filed.

Commencement is held twice annually, in December and June. Students who complete their degree requirements in August and December may participate in the December ceremony. March and June graduates may participate in the June ceremony.

Individuals completing their degree requirements in June will receive their diplomas at the June commencement. Those completing their degree requirements in December will receive their diplomas at the December commencement. Those completing their degree requirements in August or March will have their diplomas mailed to them approximately four weeks after the conferral date.

### Summary of Requirements for the Master's Degree

Listed below is a summary of the requirements graduate students must complete to earn a master's degree at Wright State University.

- 1 Complete a Program of Study form to be filed in the Office of Graduate Studies, if required by the program.
- 2 Complete the requirements for the graduate degree within five calendar years.
- 3 Achieve a cumulative grade point/hour ratio of at least a 3.0 in all courses taken for graduate credit (no more than nine hours of C are acceptable).
- 4 Be registered in the quarter the degree is conferred.
- 5 Successfully complete the final comprehensive examination (if required in program).
- 6 Present one copy of an approved thesis (if required in program).

Individual departments/colleges have requirements that must be met in addition to the general requirements set forth above. Please consult the appropriate section for specific requirements.





## The Educational Specialist Degree

Wright State University offers a post-master's program in educational leadership which leads to an Ed.S. degree. This program was created for administrators and educational leaders who seek additional training and expertise.

### Admission Requirements

Admission requirements include:

- 1 Admission to the School of Graduate Studies
- 2 A master's degree
- 3 *Superintendency Focus*: Three years of experience in administration or supervision  
*Curriculum and Instruction Focus*: Three years of teaching experience
- 4 Submission of letters of recommendation
- 5 Earned cumulative grade point average of 3.5 in master's degree study
- 6 Acceptance by faculty interviewing team
- 7 Satisfactory scores on either the GRE or the MAT

A candidate for the Educational Specialist degree must fulfill the residency requirements by completing two courses per quarter over a two-year period. Normally, the program will begin each fall quarter.

An action-oriented research project is required for completing the degree. Planning for the research project will begin in the research courses and will be implemented during the two years of the program. An oral report of the findings will be given in the advanced seminar.

Candidacy for the Educational Specialist degree is attained when the applicant has completed the action-oriented research project proposal and received the approval of his or her committee. The applicant must earn at least a B in each course to that date. This minimum requirement must be maintained after a student has been admitted as a candidate.

## The Doctor of Philosophy Degree

An interdisciplinary Ph.D. program in biomedical sciences is offered by a program faculty in a cooperative effort between the College of Science and Mathematics, the College of Engineering and Computer Science, and the School of Medicine.

A Ph.D. program in computer science and engineering is offered by a program faculty in the College of Engineering and Computer Science.

### Admission Requirements

See individual program descriptions.

### Program of Study

See individual program descriptions.

### Credit Hour Requirements

Doctoral students are required to earn a minimum of 150 acceptable quarter hours of credit. Individual programs may have a higher credit requirement.

### Residence Requirements

Residency rules require doctoral students to be enrolled full time for a minimum of four quarters. A minimum of seventy-six credit hours toward the doctoral degree must be completed at Wright State University. Individual programs may have additional residence requirements.

### Grade Standards

Graduate students working toward the Doctor of Philosophy degree must maintain at least a 3.0 grade point average in all graduate courses in which a letter grade is assigned. Students who do not meet these requirements are subject to dismissal. Individual programs have probationary procedures concerning students who are temporarily not meeting grade standards. Individual programs may utilize criteria in addition to course work grades to evaluate students' status in the program. Matters pertaining to dismissal for nonacademic matters are handled by the Office of Student Development.



### Candidacy Examination

Students must pass a candidacy examination before they begin their dissertation research. Individual programs will specify the nature and forms of their candidacy examination.

### Dissertation

Students pursuing the Ph.D. degree must conduct an acceptable original research effort and submit a dissertation based upon that research. The dissertation must be approved by the dissertation director and advisory committee.

### Final Examination and Submission of Approved Dissertation

Students pursuing the Ph.D. degree must successfully defend their dissertation before an appropriate dissertation committee. Individual programs will specify the specific format for the dissertation defense.

A copy of the approved and defended dissertation, signed by the dissertation supervisor, dissertation or advisory committee, and program director must be submitted to the graduate dean for approval. The final copy of the dissertation must be submitted to the office of the dean of Graduate Studies no later than thirty days after the date of graduation.

### Time Limit

Graduate credit applied toward the doctoral degree is valid for only nine years from the date the student enters the program. Extenuating circumstances must be acceptable to the Academic Policy Committee of the particular program.

Graduate students who fail to take courses or otherwise pursue their graduate education for a period of two years will be automatically retired from the active files of the program and of the School of Graduate Studies. Students must reapply for admission in order to reactivate their records.

### Summary of Requirements for the Doctor of Philosophy Degree

The following list is a summary of the requirements graduate students must complete to earn a Doctor of Philosophy degree at Wright State University.

- 1 Maintain a minimum grade point average of 3.0 (B)
- 2 Complete minimum program course work requirements
- 3 Be admitted to doctoral candidacy by passing a written/oral candidacy examination
- 4 Conduct an acceptable original research problem and submit an approved dissertation
- 5 Accumulate a minimum of 150 hours of acceptable graduate credit
- 6 Meet residency requirements

- 7 Successfully defend the dissertation
- 8 Be registered in the quarter the degree is conferred
- 9 Present one copy of the approved dissertation to the graduate school office
- 10 Fulfill all requirements within nine years of entrance into the program

## Certification and Certificate Programs

In addition to graduate degree programs, Wright State offers two additional types of structured curricula. One such program leads to certification status for teachers and consists of a series of courses that will qualify a teacher for certification in a specific area (see Education and Human Services section). The College of Education and Human Services also offers certificate programs for school counselors, supervisors, and school administrators. The second type of curriculum leads to a certificate awarded by the university after the completion of a specific sequence of courses. These courses may be an independent academic program or part of a master's degree program. Students who pursue the certificate as an independent program will be enrolled in nondegree status.

Certificates may be earned in the Department of English Language and Literatures (Teaching of English to Speakers of Other Languages, TESOL; and Business and Professional Writing); in the Department of Geography (Cartography, Photogrammetry, and Remote Sensing; and Urban Studies); in the Department of History (Professional Archival and Historical Administration); and in the Department of Theatre Arts (Theatre Technology). Interested students should contact the appropriate department for further information.

## Course Abbreviations

The following abbreviations are used in lists of degree requirements and in the course descriptions section of this catalog.

ACC	Accountancy
ANT	Anatomy
ATH	Anthropology
ABS	Applied Behavioral Science
ART	Art and Art History
AED	Art Education
AT	Art Therapy
BCH	Biochemistry
BIO	Biological Sciences
BME	Biomedical Engineering
BMS	Biomedical Sciences
CHM	Chemistry
CLS	Classics
COM	Communication



CME	Community Medicine
CEG	Computer Engineering
CS	Computer Science
CNL	Counseling
ECO	Economic Education, Center for
EC	Economics
ED	Education
ESE	Electrical Systems Engineering
EGR	Engineering
ENG	English
ENV	Environmental Studies
FIN	Finance
FR	French
GEO	Geography
GL	Geological Sciences
GER	German
HPR	Health, Physical Education, and Recreation
HST	History
HUM	Humanities
LAW	Law
LCS	Library and Communication Science
LI	Linguistics
MGT	Management
MIS	Management Information Systems
MKT	Marketing
MS	Management Science
MTH	Mathematics
M&I	Microbiology and Immunology
ML	Modern Language Humanities
MSE	Mechanical Systems Engineering
MUS	Music
NUR	Nursing
PHA	Pharmacology
PHL	Philosophy
PHY	Physics
P&B	Physiology and Biophysics
PLS	Political Science
PSI	Professional Psychology
PSY	Psychology
RHB	Rehabilitation
REL	Religion
SW	Social Work
SOC	Sociology
SPN	Spanish
STT	Statistics
TH	Theatre
URS	Urban Studies

## Course Numbering System

500–599 Courses that carry graduate credit only in a major field different from that of the department offering the course. Most such courses will be alternate designations of courses normally numbered 300–499.

600–699 Courses that carry graduate credit in any major field, and that have alternate designations in which the first digit is 3 or 4 when taken for undergraduate credit.

700–799 Courses intended for graduate credit only. (Unclassified students may, with the approval of the department offering the course, register for undergraduate credit in courses numbered 700–799.)

800–999 Courses normally intended for post-master's or doctoral-level work.

The number following the hyphen in each course number indicates the number of credit hours per quarter for that course.

## Policy on Dual-Listed Courses

Students who wish to receive graduate credit for dual-listed courses (e.g., courses offered at both the 400 and 600 levels) must be required to perform additional work that reflects both quantitative and qualitative advances over undergraduate requirements:

- 1 When additional readings are assigned, they should involve students with scholarly literature related to the subject of the course.
- 2 When graduate research is assigned, it should adhere to rigorous methodological strategies, emphasize primary source material where appropriate, and conform to accepted standards of scholarly style, organization, and content.
- 3 Graduate examinations may require additional or different questions and should require abstract thinking and theoretical assimilation of the course material.







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## GRADUATE PROGRAMS





## Accountancy

See Business and Administration

## Aerospace Medicine

The aerospace medicine Master of Science degree program is conducted by the School of Medicine's Department of Community Medicine. The program provides fundamental information about aviation and spaceflight biomedical factors, including physiological, psychological, bioengineering, and clinical factors. Selection and periodic examination requirements for airmen and airwomen are detailed as are normal and pathological changes associated with aging airmen and airwomen.

### The Graduate Faculty

#### *Professors*

Joseph D. Alter, public health

Winslow J. Bashe, Jr., epidemiology

Stanley R. Mohler (director), aerospace medicine

#### *Associate Professors*

Kenneth N. Beers, aerospace medicine

Satya P. Sangal, biostatistics

### Admission

The minimum requirement for admission to the M.S. degree program in aerospace medicine is the M.D. degree and a clinical year of medical training. Prospective students communicate with the Department of Community Medicine for acceptance. It is possible that certain advanced students can take individual courses in the curriculum and apply these to other degree programs.

### Degree Requirements

Students must complete the required courses plus certain electives and must conduct specific research that becomes part of the required thesis. The research may be of laboratory, field, or, in selected cases, conceptual nature.

### Program

#### Required Core Courses

CME 601, 602, 621, 622, 641, 642, 651, 652, 654, 656, 701, 731, 899; MGT 621

## Anatomy

See Biological Sciences

## Applied Behavioral Science

The applied behavioral science (ABS) program leads to the Master of Arts degree. The program trains students to perform applied behavioral research in social science, governmental, and industrial settings, and its curriculum may benefit students seeking admission to doctoral-level programs. Entering students receive interdisciplinary training in the statistical and methodological bases of research and in the planning and evaluating of applied behavioral programs. Following this basic training, each student engages in an individualized program of study in one of the areas of concentration based on his or her personal interests and professional goals. The areas of concentration are training and development, human factors, and human services. Specialization can also be arranged in related areas, depending on faculty interest. The individual program of study includes courses in research statistics and methodology, and in the area of concentration, practicum experience in a relevant applied setting, and supervised applied thesis research. Each student will be guided through the program by a faculty adviser selected to suit his or her interests and goals.

### Participating Faculty

#### Training and Development

##### *Professors*

Beverly A. Byrum (area head), androgyny, process consulting, interpersonal communication

Robert E. Pruett, public relations, mass media, persuasion theory

James E. Sayer, mass communication, rhetorical analysis

##### *Associate Professors*

Barbara W. Eakins, male/female and nonverbal communication

Ronald C. Fetzer, organizational theory training

##### *Assistant Professor*

Daniel DeStephen, psychometric assessment, research design, statistics

#### Human Factors

##### *Associate Professors*

Herbert A. Colle (area head), workload and attention, memory

Harry N. Davis, psychophysiology



**Assistant Professors**

Michael B. Hennessy, psychobiology, stress  
 Allen L. Nagy, visual science, color displays  
 Pamela S. Tsang, workload and attention, human-machine systems  
 Daniel L. Weber, psychoacoustics, cognitive mathematics

**Human Services****Professors**

Jeanne H. Ballantine (area head), relations in complex organizations, role transitions  
 Leonard Cargan, intergroup relations  
 Lawrence J. Cross, the family, society and technology  
 Helen A. Klein (director), developmental processes, early childhood  
 Lawrence A. Kurdek, developmental process  
 Jerald O. Savells (area head), social deviance, the family, stress management  
 Harvey A. Siegal, community human services, alcohol treatment  
 Warner R. Wilson, interpersonal relations, skills training

**Associate Professors**

Bela J. Bogнар, social gerontology, community mental health  
 Thomas E. Koebernick, organizational networks, research methods  
 Mary Ellen Mazey, community development

**Assistant Professors**

Jean M. Edwards, personality, stress  
 Ellen M. Murray, penology, correctional reform  
 R. Mark Sirkin, research methods, statistics  
 Norma Shepelak, criminology, deviance

**Admission**

An applicant should have a baccalaureate degree from an accredited institution, preferably in the social, behavioral, or natural sciences. A background in statistics and research design is highly desirable; a deficiency will require remedial work prior to final acceptance. Work experience in an applied behavioral or social research setting is desirable but not necessary.

A prospective student must submit official transcripts from all undergraduate institutions. Graduate Record Examination scores (verbal, analytical, and quantitative portions) are required. Three letters of recommendation are necessary, with at least one from a previous university instructor. Finally, each prospective student is asked to submit

an essay (300 words maximum) describing his or her professional goals and/or current academic interests as they relate to the ABS program.

Although students can be admitted any quarter, fall admission is recommended because of course sequencing.

**Financial Assistance**

Several forms of financial support are available to incoming students. Teaching assistantships have been available through several academic departments. Research assistantships are available through the ABS program as well as through individual faculty grants that support specific research projects. Direct employment, fellowships, and loans are also available to some students. All prospective full-time students are encouraged to apply for these opportunities.

**Degree Requirements**

The program of study has four components. The first is the research methods. Entering students develop research competence by completing the methodology course sequence. Second, each student completes an individualized set of courses in his or her concentration area consisting of foundation courses, seminars, and individually directed study. There are required and elective courses. The third part of the training, the practicum, consists of supervised observation and participation in an agency, laboratory, or organization appropriate to the concentration area. The fourth part of the training consists of the thesis. Thesis research involves a field or laboratory study appropriate to the concentration area. Field studies may be evaluations of total programs or more detailed studies of aspects of a program or system. The development of a program design or the implementation of a program may be part of the thesis research. Laboratory research can cover a wide range of areas.

Students select an area of concentration from training and development, human factors, or human services. Credit hours required for graduation vary with the concentration selected.

**Program of Study**

<b>Research Methods</b>	<b>13</b>
ABS 721, 722, 731	
<b>Concentration Courses</b>	<b>22-32</b>
Planned by student and adviser	
<b>Practicum ABS 779</b>	<b>10</b>
<b>Thesis ABS 799</b>	<b>10</b>
<b>Total</b>	<b>55-65</b>



## Training and Development

The training and development concentration is concerned with human resource development. The consulting process is used to identify such problem areas as skill deficiencies, growth constraints, and dysfunctional organizational behavioral patterns, and to devise an appropriate action for change. The training and development process is used to eliminate the problems and to provide the needed changes identified by the communication process. Students typically undertake practicum placements in industrial and organizational settings.

### Course Offerings

COM 651 Communication Consulting and Training  
COM 741 Principles and Application of

Communication Theory

ABS 751 Organizational Training and Development

ABS 752 Process Consultation

ABS 766 Work Motivation and Psychometric  
Assessment

ABS 788 Section 8—Andragogical Mystique

## Human Factors

Human factors is an area of study and research that uses knowledge of human perceptual and cognitive abilities and knowledge of motivational and social relationships to design person-machine and other environments so that the work performed in them is efficacious, efficient, and safe. The course of study includes fundamental science courses as well as application courses. Students are expected to be familiar with both laboratory and field research. The concentration follows a scientist-practitioner model.

### Course Offerings

ABS 756 Human Factors in the Systems

Development Process

PSY 665 Information Processing

PSY 766 Human Information Processing Laboratory

PSY 721 Engineering Psychology

PSY 776 Visual Science

PSY 777 Visual Science Laboratory

ABS 766 Work Motivation and Psychometric  
Assessment

ABS 853 Workspace Design and Anthropometry

PSY 625 Human-Computer Interface

PSY 761 Human Learning Psychology

PSY 675 Signal Detection Theory

PSY 759 Seminar in Human Factors

PSY 731 Vestibular Function

PSY 875 Psychoacoustics

PSY 991 Psychobiology of Stress

PSY 968 Manual Control and Psychomotor Skills

## Human Services

The human services concentration is concerned with human service delivery systems. Areas of interest include life stages (infancy, adolescence, occupational role transitions); gerontology; problems

(teen pregnancy, mental illness, divorce, unemployment); deviance (juvenile delinquency, substance abuse, family violence); corrections; health care delivery (stress, preventive education, treatment); and community development. The program is designed to produce skilled applied behavioral scientists to function within diverse settings.

### Course Offerings

ABS 741 Life Stages and Life Changes

ABS 761 Seminar in Social Deviance

ABS 788 Seminar in Applied Behavioral Science:  
Organization

ABS 775 Methods in Health Care Research and  
Evaluation

## Applied Mathematics

See Mathematics and Statistics

## Art Education

See Education and Human Services

## Art Therapy

See Education and Human Services

## Biological Sciences

The program leading to the Master of Science provides students with the opportunity to gain a solid foundation in modern interdisciplinary biology in preparation for careers as professional biologists in industry, government, or education and research organizations or for further professional training.

Areas of concentration available through the Department of Biological Sciences are cellular/molecular biology including recombinant DNA, molecular genetics; cell models of carcinogenesis, differentiation, and regulation, and organismic/environmental biology including aquatic biology, genetics, ecological physiology, parasitology, environmental microbiology, ecology, and toxicology. Concentration areas in gross anatomy, developmental anatomy, neuroanatomy, microanatomy, and ultrastructure are available through the Department of Anatomy; molecular genetics and gene cloning, protein and enzyme biochemistry, molecular regulatory mechanisms, visual biochemistry, energy transducing mechanisms, biomedical applications of magnetic resonance, and nutrition through the Department of Biochemistry; microbial physiology, immunology,



pathogenic bacteriology, medical mycology, and virology through the Department of Microbiology and Immunology; and through the Department of Physiology and Biophysics emphasis on cellular functions such as membrane ion and solute transport, and signal transduction in cardiovascular, neuro-muscular and skeletal tissues, or isolated epithelial cells of renal and intestinal origin, with an overall integration into organ and organism level approaches to health and disease. A student interested in a particular concentration area should make his or her preference known during the admission process in order to ensure proper advising.

Seminars concentrate on biological specialties. In order to provide flexibility and an interdisciplinary approach, specific prerequisites for many graduate courses are not listed. However, areas of prior training are recommended for students in order to obtain maximum benefits. In addition, the Departments of Chemistry, Geological Sciences, Mathematics and Statistics, Physics, Psychology, and the College of Engineering and Computer Science currently offer courses that support the biology program. A graduate in biology, therefore, may receive exposure to subjects in the field of specialization, in related biological fields, and to supporting disciplines outside the department.

Students may pursue an M.S. degree in biology through one of three options. Option One requires the submission and oral defense of a thesis based upon original research performed while enrolled as a graduate student at the university. Option Two requires the submission and oral defense of a thesis based on a critical review of a topic. Although there is no specific course work requirement for these two options, candidates will be advised to enroll in graduate-level courses deemed appropriate for successful understanding of the research to be undertaken. Option Two generally involves a greater level of involvement in formal graduate courses. Candidates may elect Option Two only after receiving written permission from the department chair, the graduate faculty member who will serve as the adviser, and the departmental Graduate Studies Committee. Option Three is a course work option that requires the successful completion of 45 quarter credits of graduate-level course work offered by the College of Science and Mathematics and the passing of a comprehensive examination. The desired option can be elected by students only after consultation with the chair of the Graduate Committee. Consideration for electing the appropriate option must be given to the availability of research topics and advisers and to the student's research and educational interests.

All candidates, regardless of the option chosen, are required to obtain a major adviser and an advisory committee. The advisory committee will

help formulate a study program, provide counseling, and evaluate student progress. If a student is uncertain of a major field of interest or of an appropriate option, the department graduate committee will assign a temporary adviser who will function in place of an advisory committee until the student selects an option and is accepted by an advisory professor.

Participants in all options must meet requirements for the Master of Science degree defined in the section Degree Requirements. They must, in addition, meet the specific requirements of the option chosen.

## The Graduate Faculty

### Anatomy

#### *Professor*

Joseph Zambarnard (chair), histochemistry of the dynamics of cellular transformation by oncogenic viruses

#### *Associate Professors*

Frank Nagy, ultrastructure, cell division, kinetics, male reproductive system, embryology

John C. Pearson, neuroanatomy

Larry J. Ream, osteobiology

Jane N. Scott, embryology, reproductive systems

#### *Assistant Professor*

Joel L. Cohen, neural anatomy, neurophysiology of the retina

Lothar H. Jennes, neuroendocrinology, peptide hormone receptor

Andrew J. Kuntzman, histology and ultrastructure of respiratory system

Gary L. Nieder, early embryo development, embryo implantation

### Biochemistry

#### *Professors*

Prem P. Batra, nucleotide metabolism, photobiology

Emil P. Kmetec (Emeritus), mammalian kidney, basement membranes

Daniel T. Organisciak, visual biochemistry, membrane metabolism, neuronal lipid metabolism

Robert A. Weisman (chair), *in vivo* magnetic resonance

#### *Associate Professors*

Gerald M. Alter, enzyme structure, hemoglobin conformation

H. Ira Fritz, clinical nutrition

Ira M. Leffak, chromatin structure and function

Lawrence J. Prochaska, energy-transducing membranes



**Assistant Professor**

Phillip Cruz, nucleic acid structure, NMR

John V. Paietta, gene expression

Nicholas V. Reo, carbohydrate metabolism, *in vivo* magnetic resonance

Gregory B. Young, peptide structure, NMR

**Adjunct and Joint Faculty**

Paul G. Seybold, professor (chemistry), chemical carcinogens, physical biochemistry

**Biological Sciences**

**Professors**

Larry G. Arlian, medical entomology, immunoparasitology, physiology

Wayne W. Carmichael, aquatic biology/toxicology, isolation, culture, toxicology of toxic algae

Shigeru I. Honda, plant organelle structure and function

Jerry H. Hubschman, aquatic biology, parasitology

George J. Kantor, molecular genetics, DNA repair in eukaryotes

Marvin B. Seiger, behavioral genetics, ecological genetics

**Associate Professors**

James P. Amon, microbial ecology, including molecular biology, cell biology, and electron microscopy

Clyde D. Barbour, systematics and ecology of fishes

Adrian V. Rake, molecular effects of trisomy, aneuploidy

John D. Rossmiller (chair), molecular biology

James R. Runkle, plant ecology, general ecology

Timothy S. Wood, invertebrate ecology, biology of freshwater bryozoans

**Assistant Professors**

G. Allen Burton, ecotoxicology

Pamela S. Fink, molecular biology, microbial genetics

David L. Goldstein, comparative physiology of osmoregulation, physiological ecology, ornithology

Barbara E. Hull, cell biology, histology, electron microscopy, reconstruction of skin *in vitro*

Mark D. Mamrack, cellular biochemistry, signal transduction, carcinogenesis

**Microbiology and Immunology**

**Professors**

Nancy J. Bigley, immunology

David J. Giron (acting chair), virology

J. Robert Suriano, virology

**Associate Professors**

Randall A. Smith, immunology

Donald C. Thomas, viral genetics

Richard L. Warren, microbial genetics

**Physiology and Biophysics**

**Professors**

Roger M. Glaser, exercise physiology, cardiopulmonary stresses of wheelchair locomotion

Peter K. Lauf (chair), molecular physiology and biophysics of membrane transport in erythrocytes

**Associate Professors**

Melvyn D. Goldfinger, neuroscience and biophysics of somatosensory afferents and relay nuclei

Robert W. Gotshall, renal and cardiovascular physiology

Daniel S. Miles, respiratory and cardiovascular physiology

Noel S. Nussbaum, endocrinology, skeletal tissue dynamics

Thomas J. Sernka, gastrointestinal physiology, mechanisms of electrolyte secretion and absorption

**Assistant Professors**

Robert W. Putnam, regulation of intracellular pH, membrane localization of transport systems, ionic second messengers

Kevin Strange, cellular and molecular physiology of kidney epithelium

Anne Walter, membrane fusion, viral entry, membrane protein reconstitution

**Admission**

In order to meet the minimum requirement for admission to the graduate program in biological sciences, applicants must fulfill the requirements for admission established by the School of Graduate Studies. In addition, a bachelor's degree in the biological or biochemical sciences including course work in organic chemistry, physics, and calculus is generally required. Admission preference is given to students with a grade point average of 3.0 or better on a 4.0 grading scale. Letters of recommendation are also utilized in evaluating students for admission.

**Facilities**

The life science departments are housed in modern air-conditioned buildings, well equipped with the newest research instruments. The departments maintain classrooms and research laboratories for over 150 upper-division and graduate students. Excellent ancillary facilities include specialized instrument rooms, cold rooms,



constant temperature rooms, animal rooms, a greenhouse, a radioisotope laboratory, and an electron microscopy center, including complete darkroom capability. The Biological Sciences Building, completed in 1975, contains approximately 100,000 square feet and houses facilities of the biological and health sciences departments.

Major items of available research equipment include liquid scintillation counters; amino acid analyzer; infrared, visible, and ultraviolet spectrophotometers; preparative ultracentrifuges; nuclear magnetic resonance spectrometer; mass spectrometer; a wide range of instruments for light microscopy; transmission and scanning electron microscopes; preparative and analytical chromatography instruments; specialized cell and tissue culture facilities and facilities for recombinant DNA research; and computer services (both PCs and mainframe).

A biological preserve plus additional wooded areas on campus totaling about 200 acres provides opportunities for field-oriented research and teaching experiences.

The departments have excellent working relationships with other departments on campus, with the scientific complex of Wright-Patterson Air Force Base, and with several facilities that are affiliated with the Wright State University School of Medicine.

## Financial Assistance

Several graduate teaching assistantships and a limited number of graduate research assistantships are available on a competitive basis. These appointments carry a waiver of most tuition and instructional fees for both residents and nonresidents. Appointments are made for the academic year and may be renewed for a second year. Additional assistantship support may be available for the summer quarter. See Assistantships, Fellowships, and Financial Aid section of the graduate catalog for details.

## Degree Requirements

Students who are candidates for the Master of Science degree in biology must meet all of the following requirements. In addition, some departments may have other requirements; students should check with the individual department offices for information about additional requirements.

- 1 The candidate must complete a minimum of forty-five quarter credits. A maximum of ten credits of graduate courses may be transferred from other institutions. The candidate must participate in the graduate seminars for at least four hours of credit.

- 2 The candidate must register for three consecutive quarters in the final academic year.
- 3 The candidate must maintain a 3.0 cumulative average with no more than nine credit hours of C grades applicable to the degree.
- 4 The following requirements apply respectively to the three degree options available. Option One candidates must submit and orally defend a thesis based upon original research performed while enrolled as graduate students at the university. Option Two candidates must submit and orally defend a thesis based upon a critical review of an extensive collection of published material on an appropriate subject. Option Three candidates must complete forty-five credit hours of graduate course work. A maximum of twelve credits can be earned in other departments of the College of Engineering and Computer Science, the College of Science and Mathematics, and the School of Medicine if approval to enroll in such courses is granted by the adviser. The remainder of the credits, including the four seminar credits, must be earned in the life sciences departments. A maximum of six credits of BIO 699, Special Problems in Biology, is applicable to the Option Three requirements. In addition, candidates participating in Option Three must pass a comprehensive examination administered by the advisory committee after completion of all course work.

## Biomedical Sciences Ph.D. Program

This interdisciplinary program leads to the Doctor of Philosophy degree in biomedical sciences. It recognizes the interrelatedness of the various traditional disciplines and seeks to educate scientists who are qualified to develop this potential. Classroom and laboratory instruction stresses experiences that span a broad spectrum of knowledge.

The program provides an integrated background in physical, chemical, and biological disciplines and an in-depth experience in research. Graduates are expected to be sufficiently flexible to participate in solving a broad range of complex biomedical problems.

In-depth study in the program is possible in a number of areas, including bioengineering, cellular and reproductive biology, genetics, immunobiology, molecular biology and biochemistry, neuroscience, systems and integrative biology, and toxicology and environmental chemistry. The primary aim of the program is to prepare students for a research career.



## Participating Faculty

The program is a cooperative effort between the Colleges of Science and Mathematics, the College of Engineering and Computer Science, and the School of Medicine, and includes scientists from the Cox Institute, in Kettering, Ohio, and the Armstrong Aerospace Medical Research Laboratory at Wright-Patterson Air Force Base.

The program faculty at Wright State are drawn from a number of departments including anatomy, biochemistry, biological sciences, chemistry, community medicine, computer science, engineering, family practice, mathematics and statistics, medicine, microbiology and immunology, pathology, pediatrics, pharmacology and toxicology, physiology and biophysics, psychiatry, psychology, and surgery. There are more than one hundred thirty faculty members.

## Admission

The applicant should have:

- 1 A baccalaureate degree from an accredited institution
- 2 An undergraduate grade point average of at least 3.0 on a 4.0 scale
- 3 One year of mathematics, including introductory calculus
- 4 One year of physics
- 5 One year of biology
- 6 Two years of chemistry, including an organic chemistry sequence

The Graduate Record Examination is not usually necessary, but the program faculty reserves the right to require it of individual applicants upon the request of the Admissions Committee. A prospective student must submit one official transcript from each institution attended. Under special circumstances, deficiencies in prerequisites may be waived or corrective measures arranged by action of the Admissions Committee.

## Financial Assistance

Support is available to students on a competitive basis, and includes predoctoral fellowships and teaching assistantships. Students awarded support are eligible for stipends and remission of tuition fees. Interest in financial support should be indicated at the time of application.

## Degree Requirements

Students are asked to master a series of core courses, advanced content courses, and laboratory rotations. These serve as an interdisciplinary base for the development of dissertation research. The institution awards the degree when the student satisfactorily completes the required work.

The program first develops a reservoir of basic knowledge through an interdisciplinary core,

consisting of molecular, cellular and systems biology, biostatistics, computer science, pharmacology, and immunology. The core curriculum prepares students to choose an area of advanced study. The advanced curriculum is organized into interdisciplinary tracks of areas of concentration.

The program requires students to take eighteen credit hours of advanced courses and three seminars, pass a preliminary examination based on the advanced curriculum (usually at the end of the second year), and produce an acceptable dissertation based on original research.

## Waiver of Program Requirements

Students may petition to be exempted from all or part of the core curriculum, usually by scoring a passing grade on an appropriate proficiency examination. Petitions may also be submitted for waiver of credit for previous graduate courses taken in another accredited program. Course credit of up to twelve credit hours may be waived providing (a) the grade attained in each course is a B or better, (b) the course was taken within five years of the actual waiver, and (c) the course relates to the area of concentration chosen in this program. Petitions for obtaining credit for laboratory experiences may be made, subject to the same credit hour limitations and time constraints as for courses.

## Program of Study

### Interdisciplinary Core

Physiology and Biophysics of Cells and Systems	9
Molecular Biology	10
Biomedical Sciences Laboratory	3
Introduction to Research	2
Radioisotopes	2
Cell Biology	5
Immunobiology	5
Principles of Drug Action	3
Biostatistics	4
Computer Science	4
Core Seminar	1

### Noncore Requirement

Introduction to Statistical Analysis System (SAS)	2
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### Advanced Courses

### Seminars

A minimum of three

### Laboratory Rotations

A minimum of three

### Dissertation Research

Credit hours arranged

### Total (minimum requirement)

150



The program does not have a fixed time for the awarding of the Ph.D. degree. This depends on the rate of progress of the individual student, but averages four to five years. Graduate credit applied toward the doctoral degree is valid for only nine years from the date the student enters the program. Extenuating circumstances must be acceptable to the Academic Policies Committee of the Biomedical Sciences faculty, the program director, and the dean of the School of Graduate Studies.

A minimum of seventy-six credit hours toward the doctoral degree must be completed at Wright State University. After passing the preliminary examination, students must maintain full-time registration or be retired from the program. Doctoral students must be enrolled full time for a minimum of four quarters.

## Curriculum Overview

### Year I

#### Quarter I

Molecular Biology I  
Physiology and Biophysics of Cells and Systems I  
Introduction to Research  
Radioisotopes  
Biomedical Sciences Lab

#### Quarter II

Molecular Biology II  
Physiology and Biophysics of Cells and Systems II  
Laboratory Rotation or Elective  
Biomedical Sciences Lab

#### Quarter III

Immunobiology  
Principles of Drug Action  
Cell Biology  
Core Seminar  
Biomedical Sciences Lab

#### Quarter IV

Biostatistics  
Computer Science  
Lab Rotation

### Year II

Eighteen hours of advanced courses  
Introduction to SAS  
Three seminars  
Completion of three lab rotations  
Begin research by selecting a dissertation director and an area of concentration  
Preliminary Exam

### After Year II

Research, leading to dissertation and defense

## Dissertation

The student chooses a faculty member to guide and direct the dissertation research on a daily basis. In addition, a supervisory committee is formed to periodically review the student's progress. The relationship among the student, the faculty adviser, and the committee is central to the program. The committee determines when the research may be considered completed and must approve the written dissertation, as well as the student's public defense of it. The committee certifies to the program director the competency and achievement of the dissertation.

## Grade Standards

Graduate students working toward the Doctor of Philosophy degree must maintain at least a 3.0 grade point average in all graduate courses and in all other graduate work that is assigned letter grades. The overall minimum grade point average applies only to formal academic course work, since laboratory rotations and dissertation research credits are not calculated in the grade point average. Dissertation research will receive grades of satisfactory (S) or unsatisfactory (U) until the dissertation is accepted; these will then be converted to a standard letter grade. A 3.0 average and the recommendation of the student's supervisory committee and the program director are required for graduation.

Any student whose cumulative grade point average falls below 3.0 will be placed on probation. For students beyond the core curriculum, failure to reattain a cumulative grade point average of 3.0 within the next twelve credit hours of course work will result in a recommendation for dismissal from the program.

Students enrolled in the core curriculum must achieve an overall grade point average of at least 3.0 at the completion of the core requirements. Students who complete the core curriculum with a grade point average of less than 2.7 will be recommended to the dean of the School of Graduate Studies for dismissal from the program. Students with a grade point average above 2.7 but below 3.0 will be given an opportunity to repeat part of the curriculum while continuing into advanced courses on a probationary status as determined by the program director.

Students who repeat all or part of the core curriculum must achieve an overall 3.0 grade point average by the time an additional twenty-four credit hours of letter-graded course work have been completed. Failure to do so will result in a recommendation for dismissal.

Students must attain a grade of A or B in any repeated core course or face dismissal from the program. The grade received the second time will be used in calculating the student's grade point average.



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Students who fail the preliminary examination at the end of the second year will either be dropped from the program or be allowed one reexamination, depending on the recommendation of the Examination Committee.

Matters pertaining to dismissal for nonacademic matters are handled by the Office of Student Development.

### Summary of Requirements

Listed below is a summary of the requirements for the Doctor of Philosophy degree in biomedical sciences at Wright State University. Students must:

- 1 Complete core and advanced courses with a minimum grade point average of 3.0 (B)
- 2 Choose a dissertation director and a supervisory committee with the approval of the program director
- 3 Pass a preliminary examination over the advanced curricular content
- 4 Successfully prepare a written dissertation proposal and make an oral presentation of it to the supervisory committee
- 5 Accumulate a minimum of 150 didactic, laboratory, and research quarter hours
- 6 Conduct an acceptable original research problem, submit an approved written dissertation, and make a successful public defense of it
- 7 Be certified by the program director as having completed all requirements for the Ph.D. degree, including the accomplishment of an acceptable dissertation
- 8 Meet residency requirements
- 9 Be registered in the quarter in which the degree is conferred
- 10 Present two copies of the approved dissertation to the School of Graduate Studies
- 11 Fulfill all requirements within nine years of entrance into the program

Students who have an M.D. degree or are in good standing in the preclinical curriculum of an accredited medical school may be exempted from the BMS core curriculum. Depending on the area of concentration, and the recommendation of the dissertation director, a student may be exempted from twelve hours of advanced courses based on medical credit. Similarly, one of the three lab rotations may be exempted if a student has previously participated in a research project. Topics for the preliminary exam shall be specified by the supervisory committee. Students must accumulate a minimum of 100 quarter hours in the biomedical sciences. All other requirements for the Ph.D. in biomedical sciences are the same as listed previously.

## Areas of Concentration

### Bioengineering/Biodynamics

Advanced study in biomedical engineering and biodynamics has emerged as a valuable approach to the understanding of complex biological systems. Current areas of interest include medical imaging of bone and noninvasive measurement of bone density; diagnostic ultrasound, biological signal processing, and tissue characterization; mathematical modeling and advanced data manipulation via computer simulation, especially of the cardiopulmonary system and skeletal and cardiac muscle; theoretical and experimental study of gas transport with high frequency ventilation; rehabilitation engineering and devices to aid the disabled, including functional electrical stimulation of muscle and augmentative communication devices.

The scope of health care is increasingly dependent on engineering concepts for the invention of sophisticated new research, diagnostic, and therapeutic instruments, prostheses, and other medical devices. Also, the application of systems engineering to pharmacokinetics in disease states is expected to provide more effective drug therapy.

Courses emphasize engineering principles and their application, including biomechanics, biofluids, biotransport and artificial internal organs, biomaterials, biothermodynamics and heat transfer, biophysics, mathematical modeling and computer simulation, medical instrumentation, and medical imaging.

BMS 655 Matrix Algebra	5
BMS 701 Advanced Biomedical Computers	4
BMS 702 Control Systems I	4.5
BMS 703 Control Systems II	4.5
BMS 705 Linear Systems I	3
BMS 706 Linear Systems II	3
BMS 708 Digital Signal Processing	3
BMS 712 Biodynamics	3
BMS 713 Advanced Biomechanics and Biofluids	3
BMS 714 Advanced Engineering Biophysics	3
BMS 717 Advanced Bioinstrumentation	4
BMS 721 Biomedical Electronics	4
BMS 855 Cardiovascular Control Mechanisms	3
BMS 856 Cardiac Dynamics	3
BMS 858 Renal Function	3
BMS 859 Gastrointestinal Physiology	3
BMS 860 General Endocrinology	3
BMS 861 General Endocrinology Lab	2
BMS 862 Physiological Control Mechanisms	3
BMS 863 Physiological Control Mechanisms Lab	2
BMS 864 Physiological Aspects of Exercise	5
BMS 990 Seminar	1-3
BMS 991 Special Topics	1-15
BMS 999 Dissertation Research	1-15



## Biosystems

Biosystems teaches the physiological and biophysical approach to understanding life processes at the organ and cellular level and thus serves to explain pathophysiological deviations from the normal. Coronary artery disease, hypertension, and stroke are major causes of human morbidity and mortality in the United States. Chronic renal disease and broncho-pulmonary illnesses, such as emphysema and asthma, contribute heavily to the patient population, and gastrointestinal illnesses, such as ulcers, cause more hospitalizations than any other diseases. In addition, nervous and mental disorders affect a significant proportion of the patient population in this society. A preventative approach toward these diseases is most desirable; however, to accomplish this aim it is necessary to increase research directed to the understanding of each of these organ systems and their interactions. Behavioral disorders, painful illnesses, sleep disorders, paralysis, population control, birth defects, and sterility are well-known areas where rapid progress is needed.

Students will have the option of performing research with human or animal models. Faculty research interests include regulation of blood pressure and renal blood flow, the effect of stress on cardiovascular and pulmonary function, the effect of hypertension on the placenta and fetus, muscle and exercise physiology with simultaneous studies at the cellular level, autonomic control, bone formation and growth, fluid and electrolyte balance, transport in the gastrointestinal system, the structure and function of the reproductive systems, and the structure and function of the nervous system.

BMS 701 Advanced Biomedical Computers	4
BMS 713 Advanced Biomechanics and Biofluids	3
BMS 714 Advanced Engineering Biophysics	3
BMS 717 Advanced Bioinstrumentation	4
BMS 754 Molecular Biology of Learning and Memory	3
BMS 837 Human Gross Anatomy	8
BMS 840 Reproductive Anatomy and Physiology	2
BMS 842 Experimental Teratology	3
BMS 843 Experimental Teratology Laboratory	3
BMS 855 Cardiovascular Control Mechanisms	3
BMS 856 Cardiac Dynamics	3
BMS 857 Pulmonary Physiology	3
BMS 858 Renal Function	3
BMS 859 Gastrointestinal Physiology	3
BMS 860 General Endocrinology	3
BMS 861 General Endocrinology Lab	2
BMS 862 Physiological Control Mechanisms	3
BMS 863 Physiological Control Mechanisms Lab	2
BMS 864 Physiological Aspects of Exercise	5
BMS 898 Neuropharmacology	3
BMS 902 Neurophysiology	3
BMS 903 Human Neuroanatomy	5

BMS 904 Cellular Neuroanatomy	3
BMS 905 Information Processing	4
BMS 909 Sensory Processes	4
BMS 911 Neuropsychology/Neuroethology	4
BMS 912 Experimental Methods in Neuroscience	4
BMS 913 Fundamentals of Human Neurobiology	4
BMS 990 Seminar	1-3
BMS 991 Special Topics	1-15
BMS 999 Dissertation Research	1-15

## Genetics

The structure and functional diversities of cells and organisms reflect differences in their inherited genetic information. The study of genetics is an attempt to correlate the observed characteristics of cells with the information carried by their DNA. Recent successes in this area are embodied by the ability to dissect and recombine DNA at the molecular level, to prenatally diagnose certain inherited diseases, and to approach an understanding of the mechanisms of tumor formation.

Students in the genetics concentration initially receive thorough instruction in one of the broad fields of genetics (molecular, microbial, or human) and, through subsequent course work, define a more limited area of interest and investigation. Through a series of lecture, laboratory, seminar, and independent study experiences, students are trained in modern methods of characterizing the genetic material. The methods used in such characterizations are at any level from the cell to the individual. These techniques include recombinant DNA methodology, gel electrophoresis, modern cytogenetic procedures, and computerized statistical analysis.

The goal of the genetics group is to produce researchers with broad expertise, capable of drawing on a multidisciplinary background to attack current problems in genetics.

BMS 754 Molecular Biology of Learning and Memory	3
BMS 769 Biochemistry of Membranes	3
BMS 770 Biological Macromolecules	3
BMS 772 Human Heritable Metabolic Diseases	4
BMS 773 Biochemical Regulation	3
BMS 779 Molecular Genetics	3
BMS 780 Human Genetics	4
BMS 785 Advanced Seminar in Genetics	2
BMS 786 Behavior Genetics	3
BMS 791 Microbial Genetics	3
BMS 792 Microbial Genetics Lab	3
BMS 808 Molecular Virology	3
BMS 809 Viral Oncology	3
BMS 812 Immunobiology	5
BMS 990 Seminar	1-3
BMS 991 Special Topics	1-15
BMS 992 Dissertation Research	1-15



**Molecular and Cellular Biology**

One of the most important aspects of present-day biomedical research is the determination of the regulatory mechanisms of cellular and molecular processes. Research in this area has a great bearing on cancer, heart disease, and aging. In addition, basic research in regulation is necessary for an understanding of normal human growth, the ontogenic development of the immune system, and tissue differentiation. An understanding of the etiology of disease must consider tissue receptor-ligand binding, membrane properties, cellular steady state processes, the mechanisms of active energy-dependent and passive movements of ions, and the hormonally regulated water fluxes across biological membranes, macromolecular conformation of biological units and subunits, control of enzymatic activity in metabolic pathways, cyclic nucleotide effects, chromatin structure, gene expression, energy metabolism, immunological reactions, cell-cell interactions, hormonal effects, and a number of other regulatory phenomena. Each of these areas is covered within the molecular and cellular concentration. Our purpose is to train investigators to take an interdisciplinary approach to problems of regulation.

After students complete the core curriculum and enter the advanced curriculum, they are required to take at least one course from each of three subset groups identified as molecular, cellular, and genetic. Examples of the subset courses are enzymes (molecular), membrane biochemistry (cellular), immune regulation (cellular), molecular genetics (genetic), and molecular virology (genetic). Other advanced courses may come from any of the subset groups or outside the area, depending on the program.

BMS 736 Chemical Kinetics	3
BMS 737 Chemical Thermodynamics	3
BMS 738 Selected Topics in Physical Chemistry	3
BMS 767 Enzymes	3
BMS 768 Biochemistry of Peptide Hormones	3
BMS 769 Biochemistry of Membranes	3
BMS 770 Biological Macromolecules	3
BMS 771 Radioisotope Principles	2
BMS 772 Human Heritable Metabolic Diseases	4
BMS 773 Biochemical Regulation	3
BMS 774 Biochemistry of Connective Tissue	3
BMS 775 Photobiology	3
BMS 791 Microbial Genetics	3
BMS 792 Microbial Genetics Lab	3
BMS 793 Microbial Ecology	5
BMS 795 Microbial Physiology	4.5
BMS 796 Microbial Physiology Lab	2
BMS 799 Human Parasitology	2
BMS 801 Host-Parasite Interaction	4
BMS 802 Pathogenic Microbiology	3
BMS 804 Medical Mycology	4

BMS 808 Molecular Virology	3
BMS 809 Viral Oncology	3
BMS 812 Immunobiology	5
BMS 813 Special Topics in Immunology	2-8
BMS 818 Infection and Immunity Seminar	3
BMS 990 Seminar	1-3
BMS 991 Special Topics	1-15
BMS 999 Dissertation Research	1-15

**Toxicology and Environmental Chemistry**

Courses in this concentration are arranged for a specific curriculum in professional toxicology, environmental characterization and control, or environmental toxicology.

The fundamental role of chemicals in life processes is well recognized, but there is also great concern about the impact that chemicals from biogenic, anthropogenic, or physical environmental sources have on humans and all other forms of life. Scientists with qualifications in a wide range of areas are needed to solve the problems of incompatibility between life and chemicals, many of which seem essential for humans to flourish. Complex issues, such as risk-versus-benefit, must be addressed by these scientists. Examples of potentially life-threatening substances include pollutants synthesized by humans with the intention of aiding survival, such as insecticides and herbicides; chemicals arising from photochemical processes after their precursors are introduced into the atmosphere; drugs administered for therapeutic or other purposes; and poisons that are normal byproducts of plant or animal metabolism. Research and service contributions will depend on individuals who are thoroughly prepared in analytical chemistry, environmental health, pathology, pharmacology, and toxicology.

BMS 735 Advanced Inorganic Chemistry III	3
BMS 740 Advanced Bioanalytical Chemistry	5
BMS 879 General Pharmacology I	5
BMS 880 General Pharmacology II	4
BMS 886 General Pathology	6
BMS 887 General Toxicology I	4
BMS 888 General Toxicology II	4
BMS 890 Biotransformation and Kinetics	3
BMS 893 Methods in Environmental Toxicology	4
BMS 990 Seminar	1-3
BMS 991 Special Topics	1-15
BMS 999 Dissertation Research	1-15

**Business and Administration**

The College of Business and Administration offers degree programs leading to the Master of Business Administration (M.B.A.) and Master of Science in logistics management degrees. Each student's program is planned on an individual basis, taking into consideration the student's background,



needs, and objectives. This allows either program to be built on the student's undergraduate work in business, the arts, sciences, engineering, or other fields of study.

The specific aims and basic assumptions of the M.B.A. program include the following: emphasis on broad concepts and analytical tools rather than on descriptive information and techniques; development and enlargement of the individual's understanding of the economic, political, social, and technological environment of business and the responsibility of those in business to these environments; an opportunity to develop professional competence in a special field of the student's own choosing; and the provision of a foundation for continuing education and development.

An internship program is available to superior full-time M.B.A. students, to provide an opportunity to apply theoretical and analytical skills in the real business environment of a private or governmental organization. The internship is especially valuable to individuals who lack an undergraduate business education or working experience in business. Students interested in further information should contact the chair of the department in which they wish to do their internship.

The Master of Science in logistics management program offers an alternative to the traditional business degree. The program combines the study of business administration with advanced logistics courses. In an era of shrinking product life cycles, proliferating product lines, shifting distribution chains, and changing technology, mastery of logistics has become an essential ingredient of competitive success. The M.S. in logistics management program provides an excellent educational background for this purpose.

The curriculum offers an interdisciplinary approach to cover broad concepts and analytical tools. The objective is to provide a broad preparation to students for positions in acquisition, systems management, materials management, warehouse management, inventory control, distribution, and logistics planning. The program is both applied- and research-oriented and hence offers students an opportunity to achieve their varied professional and educational goals.

The curriculum approach, the program orientation, and the program emphasis on the "business" and "systems" of logistics, all combine in a degree program to support the needs of a wide range of persons in government and industry such as the following:

- 1 Technical logisticians who need the management education and preparation for growth and career advancement
- 2 Individuals with an educational background (either technical or liberal) who seek both a management and a technically focused graduate program in logistics

- 3 Practicing logistics professionals who wish to develop a broader knowledge of the logistics fields

Graduate business programs in the College of Business and Administration are accredited by the American Assembly of Collegiate Schools of Business.

A chapter of Beta Gamma Sigma, the national scholastic honor society in the field of business and administration, was established by the College of Business and Administration in 1976.

The College of Business and Administration also offers a dual degree program that combines the M.B.A. with a Master of Science degree in social and applied economics. See the dual degree entry at the end of this section for details.

## The Graduate Faculty

### Accountancy

#### *Professors*

Joseph F. Castellano, financial and governmental accounting

Dean S. Eiteman, financial and managerial accounting

Nabil Hassan, managerial and financial accounting

Donald F. Pabst, financial and managerial accounting

Jacob B. Paperman, auditing and accounting systems

Harper A. Roehm, financial and managerial accounting

John C. Talbott, Jr., taxation and managerial accounting

#### *Assistant Professor*

Sonia A. Brecha, financial accounting, accounting systems, and international accounting

Russell H. Hereth, taxation

### Economics

For list of Department of Economics graduate faculty, see Economics

### Finance, Insurance, and Real Estate

#### *Professors*

Peter W. Bacon (chair), financial management

Lawrence J. Gitman, financial management

Waldemar M. Goulet, financial management, real estate

Nicolas Gressis, financial management, investments



**Associate Professors**

Khurshid Ahmad, insurance, real estate, personal finance

Richard E. Williams, financial management, investments

**Assistant Professors**

M. Fall Ainina, financial management, investments

Daniel J. Kaufman, Jr., financial institutions, financial management

James E. Larsen, real estate, financial management

**Management**

**Professors**

Charles J. Hartmann, legal environment of business, government regulation, economic analysis of law

George E. Kirk, administrative law, management

Horace W. Lanford, technical forecasting, technology assessment, research and development management, systems management, long-range planning

John V. Murray (Emeritus), organizational behavior, long-range forecasting, strategic management

Frank A. Stickney, strategic management, systems management, business policy, organizational behavior

Thomas J. Von der Embse, organizational behavior and design, management theory, health care management, noncognitive skills for management

**Associate Professors**

James M. Daily, organizational behavior, personnel management, organization development

Herman A. Waggener, computer-based management information systems, materials management, strategic management

**Management Science and Information Systems**

**Professors**

Michael J. Cleary, quantitative methods, computer applications, quality management

Myron K. Cox, research methodology

**Associate Professors**

Gordon K. Constable, logistics management, production operations, quality, statistics

W. Steven Demmy, management information systems, logistics, production and inventory management

Jon R. Hobbs, logistics modeling, simulation, reliability, management information systems.

Andrew W. Lai, quantitative methods for business, logistics systems, computer simulation, decision support systems

Michael J. O'Connell (chair), operations management, operations research, decision analysis, conflict analysis

Vincent C. Yen, operations research, management science, statistics, management information systems

**Assistant Professor**

Nada R. Sanders, forecasting, decision theory, materials management, expert systems

**Marketing**

**Professors**

Herbert E. Brown, pricing management, product management, marketing management

Peter S. Carusone, contemporary marketing issues, entrepreneurship, marketing strategy

Robert J. Kegerreis, marketing management and strategy

Inder P. Khara, marketing strategy, consumer behavior, marketing communications, international marketing

M. Venkatesan (David L. Rike Professor of Marketing), consumer behavior, marketing research

Gordon L. Wise, advertising, credit management

**Associate Professors**

Beverlee B. Anderson, marketing research, consumer behavior, advertising

Thomas D. Dovel, marketing policy, marketing research

John C. Hafer (chair), sales management, marketing research

I. Wade Lancaster III, channels of distribution, retailing, health services marketing, marketing management

**Admission**

Admission to the M.B.A. program or M.S. in logistics management program requires application to the School of Graduate Studies. All applicants must hold a baccalaureate degree from a regionally accredited institution and must submit official transcripts from all colleges attended and official scores on the Graduate Management Admission Test (GMAT—formerly the ATGSB).

Admission to either program is based on a variety of criteria including prior academic performance, test scores, intellectual capacity (including quantitative and analytical skills), preparedness for graduate study, and other factors which, in the judgment of the College of Business and Administration, indicate potential for successful completion of the program.

Permission to enroll in 600- and 700-level courses in the College of Business and Administration is required of all graduate students



not admitted as degree candidates to the M.B.A. program, the M.S. program in logistics management, the M.S. program in social and applied economics, or a program with a formal articulation agreement with the College of Business and Administration. Nondegree and transient students as well as degree students in nonaffiliated programs seeking to enroll in 600- and 700-level courses must secure the written approval of the director of graduate programs in business and economics before submitting their registration forms. In the absence of such approval, the student's registration for those classes will not be processed. The College of Business and Administration reserves the right to cancel any improper or unauthorized registrations.

### Regular Admission

Students who have met all standards for admission to the program will be admitted on a regular basis and without conditions.

### Conditional Admission

Those students who do not meet the standards for regular admission but feel they are qualified for graduate work may petition the Graduate Programs Committee for conditional admission. All students must complete formal application requirements prior to petitioning. Petitions must be initiated through the School of Graduate Studies after consulting with the director of graduate programs in business and economics. Upon completing twelve credit hours of graduate course work and meeting all other admission requirements specified by the college, students who have been conditionally admitted will either be converted to regular status or refused further registration.

### Nondegree in Business

Applicants who meet all requirements for regular admission but who do not wish to pursue a degree may be admitted as nondegree students. Nondegree students are expected to follow all graduate school requirements for such status. Nondegree students wishing to become degree candidates must reapply to the admissions office and may apply only twelve credit hours of Stage II requirements toward the degree.

## Degree Requirements

### Stage I—Preparatory Course Work

The following information outlines the preparatory requirements for both the M.B.A. and M.S. in logistics management degree programs. Candidates should consult with an academic graduate adviser in the College of Business and Administration for further details concerning policies and programs.

All candidates must have or obtain a knowledge of fundamentals in the following areas: accountancy, business finance, business law, computing and information systems, economics, management, marketing, quantitative methods, and statistics. Students deficient in any of these areas are required to successfully complete up to thirty-three credit hours of Stage I preparatory course work. Individual courses may be waived for students who have successfully completed comparable courses at a regionally accredited institution. Waiver of preparatory course work is based on the grade received, credit hours, when the course was completed, course content, and focus. Additionally, students may demonstrate preparation by proficiency testing. The Stage I Program of Study form must be completed by students before they will be permitted to register for graduate business courses.

Stage I—Preparatory Courses	0–33
ACC 621, 622 Graduate Survey of Accounting, I, II	6
LAW 611 Graduate Survey of Law and the Legal Environment	3
EC 621, 622 Graduate Survey in Principles of Economics	6
FIN 621 Graduate Survey in Financial Management	3
MGT 621 Graduate Survey in Management	3
MKT 621 Graduate Survey in Marketing	3
MS 621 Survey of Mathematics for Business, Economics, and Logistics Research	3
MS 622 Graduate Survey in Statistics	3
MIS 621 Introduction to Management Information Systems	3

### M.B.A. Program of Study

#### Stage II—Core and Concentration Course Work (M.B.A.)

After completing appropriate Stage I preparatory courses, students undertake the Stage II core and concentration courses, a forty-eight to fifty-seven hour program. Thirty credit hours of core courses are required of all candidates, including micro- and macroeconomic theory; two courses in quantitative methods; a course in organizational behavior theory; one course each in the disciplines of accounting, finance, management, and marketing; and a course in administrative policy and decisions, which should be taken as the last course in the program.

Further, all students are required to select one, and may choose two, area(s) of concentration from accountancy, finance, financial administration, health care management, logistics management, management, management science, or marketing. Students have the flexibility to choose and structure



## 60 Programs/Business and Administration

their concentration(s) to meet career objectives by selecting courses that together provide emphasis within their area(s) of concentration. Students taking graduate business courses are to follow course prerequisite requirements. Candidates for the M.B.A. degree will complete a Stage II Program of Study form, in conjunction with their assigned faculty adviser in accordance with university and college policy. Students must coordinate with an M.B.A. adviser prior to commencing Stage II core and concentration work and prior to meeting with their faculty adviser.

### Stage II 48-57

#### Core Courses (M.B.A.) 30

MS 715 Statistical Methods for Business Decisions*	3
MS 717 Quantitative Methods for Business Decisions*	3
MGT 700 Organizational Behavior and Theory	3
EC 715 Applied Microeconomics	3
EC 717 Applied Macroeconomics	3
ACC 741 Managerial Accounting	3
FIN 741 Financial Management	3
MGT 741 Operations Management	3
MKT 741 Marketing Strategy	3
MGT 731 Administrative Policy and Decisions**	3

#### Area of Concentration Courses (M.B.A.) 18-27

See the following for Stage II area of concentration course work (M.B.A.)

\*MS 715 and 717 should be completed within the first eighteen hours of Stage II work.

\*\*MGT 731 should be taken after all other core courses are completed, preferably during the last quarter of the program.

### Stage II—Areas of Concentration Course Work (M.B.A.)

#### Accountancy 27

##### Required Concentration Courses 21

ACC 711, 712, 713 Financial Accounting Concepts I, II, III	9
ACC 721 Federal Income Tax Accounting	3
ACC 723 Managerial and Financial Information Systems	3
ACC 754 Financial and Operational Auditing	3

##### Accounting Elective 3

##### Concentration Electives (Nonaccountancy) 6

#### Finance 18

##### Required Concentration Courses 12

FIN 702 Financial Institutions and Markets	3
FIN 710 Investment Management	3
FIN 742 Seminar in Financial Theory	3
Another 700-level finance course	3

#### Concentration Electives 6

Three of the six hours must be business courses, but none may be finance courses.

#### Financial Administration 18

##### Required Concentration Courses 12

FIN 742 Seminar in Financial Theory	3
FIN 743 Seminar in Working Capital Management	3
ACC 711, 712 Financial Accounting Concepts I, II	6

##### Concentration Electives 6

Accounting seminar course	3
Finance seminar course	3

#### Health Care Management 18

##### Required Concentration Courses 12

EC 755 Economics of Health and Health Policy	3
FIN 750 The Financial Management of Health Service Organizations	3
MGT 755 Health Care Management	3
PHL/REL 578 Ethics and Medicine	3

##### Concentration Electives 6

Three of the six hours must be in business courses.

#### Logistics Management 18

##### Required Concentration Courses 12

MKT 713 Logistics Systems	3
MS 760 Logistics Systems Design	3
Two courses from the following:	
ACC 752; MGT 750, 751, 752; MS 650, 765	6

##### Concentration Electives 6

Two three-hour business economics or nonbusiness graduate courses must be selected.

#### Management 18

##### Required Concentration Courses 6-12

The management concentration is highly flexible. The overall requirement is that students take 6-12 hours of management courses.

##### Concentration Electives 6-12

Six hours must be nonmanagement business courses.

#### Sample Management Curricula

Personnel/Organizational Behavior
MGT 703, 705, 706, 753B, 753D, 753E
Production/Operations
MGT 751, 752, 753A, 763
Systems/Research and Development Management
MGT 711, 714, 753C, 763

Students may choose a specific program as illustrated or follow a program that suits individual or organizational needs.



**Management Science 18**

A total of six courses must be selected from the two groups below.

**Required Concentration Courses 9-12**

Three to four courses from the following:  
MS 650, 725, 729, 730, 760, 765, 770, 781

**Concentration Electives 6-9**

Two to three courses from the following:  
ACC 752; EC 609, 612, 780; MGT 751, 752, 753A;  
MKT 707, 713; MIS 760

**Marketing 18****Required Concentration Courses 12**

MKT 707 Marketing Research and Analysis 3  
Three additional 600- or 700-level marketing courses chosen, based on the student's career objectives\* 9

**Concentration Electives 6**

Must be nonmarketing business courses

\*Examples of career objectives include sales management, international marketing, advertising, entrepreneurship, marketing research, consumer marketing management, industrial marketing management, and logistics.

**Dual Degree with Economics**

Students may obtain both the Master of Business Administration degree and the Master of Science degree in social and applied economics under the dual degree program, which permits common course work to apply to both programs. Students who complete the M.B.A. degree at Wright State may transfer up to eighteen hours to apply to the requirements of the M.S. program, as long as all M.S. program courses are completed within the time limit set for completion of graduate degree programs. This policy does not apply to students who receive M.B.A. degrees from schools other than Wright State. For further information, contact the director of graduate programs in business and economics.

**Master of Science in Logistics Management Program of Study****Stage II—Core and Concentration Course Work (M.S.)**

The following outlines the requirements for the M.S. in logistics management degree. Candidates should consult with the program adviser for further details concerning policies and programs.

The program for the M.S. in logistics management requires the completion of forty-eight credit hours of Stage II work. Stage I courses that are required may be completed prior to or during the first fifteen credit hours in the Stage II program.

Students taking graduate business courses are expected to follow course prerequisite requirements. Candidates must complete a Stage II Program of

Study form with their assigned faculty adviser in accordance with university and college policy. Students must coordinate with a graduate adviser prior to commencing Stage II core and concentration work and prior to meeting with their faculty adviser.

Of the forty-eight credit hours required for Stage II curriculum, twenty-four hours are core courses, twelve hours are required concentration courses, and twelve hours are concentration electives (six elective credit hours may be master's thesis).

**Stage II 48****Core Courses (M.S.) 24**

MS 715 Statistical Methods for Business Decisions	3
MS 717 Quantitative Methods for Business Decisions	3
MS 730 Operations Research Techniques for Business Decisions	3
MGT 700 Organizational Behavior and Theory	3
MGT 741 Operations Management	3
MGT 751 Production and Inventory Management	3
ACC 741 Managerial Accounting	3
ACC 752 Business Information Systems	3

**Area of Concentration Courses (M.S.) 24****Stage II—Area of Concentration Course Work (M.S.)****Concentration Courses 24**

<b>Required Concentration Courses 12</b>	
MS 760 Logistics Systems Design	3
MIS 760 Management Information Systems, Analysis, and Design	3
MKT 713 Logistics Systems	3
MGT 750 Materials Management	3
<b>Concentration Electives 12</b>	
MS 650 Systems Simulation in Business and Economics	3
MS 765 Inventory Management	3
MS 770 Selected Topics in the Management Sciences	3
MGT 752 Quality Assurance	3
MGT 763 Systems Management	3
MGT 799 Thesis	6
ACC 753 International Accounting	3

**Cartography, Photogrammetry, and Remote Sensing**

Contact the Department of Geography for information about these certificate programs.



# Chemistry

The Department of Chemistry offers a graduate program leading to the Master of Science degree in chemistry. Balanced programs of course work and research are individually designed to prepare students for careers as professional chemists. Joint programs with other departments are encouraged for students interested in pursuing interdisciplinary research with emphasis in chemistry.

## The Graduate Faculty

### Professors

Rubin Battino, physical chemistry

Sue C. Cummings, inorganic and bioinorganic chemistry

M. Paul Servé, organic and medicinal chemistry

Paul G. Seybold, physical and biophysical chemistry

Thomas O. Tiernan, physical, analytical, and environmental chemistry

### Associate Professors

William A. Feld, organic and polymer chemistry

John J. Fortman, inorganic chemistry and chemical education

Subrata Ghosh (WSU Lake Campus), organic, natural products, and polymer chemistry

George G. Hess (chair), organic, analytical, and polymer chemistry

James J. Kane, organic and polymer chemistry

Vladimir Katovic, analytical, inorganic, and environmental chemistry

Kenneth Turnbull, organic chemistry

### Assistant Professor

Daniel D. Bombick, analytical chemistry

David A. Grossie, inorganic chemistry, X-ray crystallography

Daniel M. Ketcha, organic and natural products chemistry

## Admission

In order to meet the minimum requirements for admission to the graduate program in chemistry, applicants must fulfill the requirements for admission established by the School of Graduate Studies. In addition, applicants must have completed basic calculus, one year of physics, and approximately fifty quarter hours (thirty-three semester hours) of chemistry, including lecture and laboratory courses in general chemistry, quantitative analysis, and introductory courses in organic, inorganic, and physical chemistry. Students who do not meet these requirements will be asked to do so in addition to fulfilling the usual graduate degree requirements.

## Degree Requirements

In order to qualify for the Master of Science degree, candidates must fulfill the requirements of the School of Graduate Studies, complete thirty credit hours of course work and a minimum of fifteen credit hours of thesis research, submit an acceptable thesis, and pass a written or an oral examination.

## Courses

Candidates for the Master of Science degree must complete thirty credit hours of course work in chemistry and related fields, including designated chemistry core courses. The chemistry courses must be numbered 600 or above and comprise a program acceptable to the advisory committee. The related courses must be numbered 500 or above and be acceptable to the advisory committee.

## Language Requirement

A reading knowledge of a foreign language is not required for the Master of Science degree in chemistry. However, certain students, because of the nature of their specific area of interest in chemistry, may be required to demonstrate an ability to read chemical literature in a foreign language.

## Residency Requirement

Full-time residency is not required to qualify for the Master of Science degree. However, students must be registered for three consecutive quarters of full- or part-time study.

## Thesis

The candidate must enroll in CHM 899 (thesis research) under the supervision of an adviser approved by the advisory committee. An acceptable thesis based on a minimum of fifteen credit hours of laboratory or theoretical research (CHM 899) must be submitted to an examining committee (chaired by the candidate's adviser and selected by the adviser and the department chair). The thesis must be submitted in final form by the candidate no later than six months following the last quarter of enrollment in CHM 899. Three copies of the final draft of the thesis must be submitted to the committee and the department chair for approval prior to binding. After approval by the School of Graduate Studies, one copy will be deposited in the library. One copy is kept by the adviser and one copy is kept by the department chair.

After the presentation of the thesis and at least two weeks prior to the date proposed for conferring the degree, the candidate must pass a written or an oral examination. If the student's record is satisfactory, the scope of the examination will generally be confined to the candidate's field of specialization.



# Classroom Teacher

See Education and Human Services

## Computer Science and Computer Engineering

The Department of Computer Science and Engineering offers programs of graduate study leading to the Master of Science degree in computer science, the Master of Science in Computer Engineering degree, and the Doctor of Philosophy degree in computer science and engineering. The programs include concentration of study in specific areas of computer science and engineering. Programmatic strength lies in the unique blend of faculty expertise, in the marriage of theory with software and hardware design, and in the laboratory facilities available to the program.

The graduate program of study leading to a Ph.D. in computer science and engineering is offered by the computer science and engineering faculty plus other qualified faculty of the College of Science and Mathematics and the College of Engineering and Computer Science, particularly from the Department of Mathematics and Statistics and the Department of Electrical Systems Engineering.

Most courses are offered in the late afternoon to allow practicing computer professionals to begin the program on a part-time basis.

### The Graduate Faculty

#### Professors

James E. Brandeberry, digital electronics, microprocessors, system theory

Larry A. Crum (chair), microprocessors, distributed computing, hardware design, computer communications

Henry W. Davis, artificial intelligence, computer science theory

Robert D. Dixon, software design, real-time systems, computer organization

Alastair D. McAulay, parallel processing algorithms and architectures, optical computation

Terry A. McKee, graph theory, logic

Won J. Park, Markov stochastic modeling, queueing theory, reliability

Donald J. Schaefer, operating systems, numerical analysis

B. A. Shenoi, digital filters and signal processing, image processing, digital communication

#### Associate Professors

Joseph Kohler, compilers, software design, languages, microprocessors

Thomas G. Purnhagen, computer design, multiprocessing, real-time computer applications

Kuldip S. Rattan, digital control systems, robotics, computer-aided design, microprocessors

Charles B. Ross, digital systems design, data communications

Alton F. Sanders, artificial intelligence, languages, operating systems

Robert C. Shock, data analysis and data base systems, expert systems, software engineering

Raymond E. Siferd, integrated circuits, signal processing, robotics

#### Assistant Professors

Lokesh Datta, digital systems design, algorithm complexity, digital signal, image processing

Verlynda S. Dobbs, software engineering, network operating systems

David Hemmendinger, concurrency, artificial intelligence, logic programming, functional programming

Gurdeep S. Hura, Petri net modeling, concurrent systems, computer communication networks, simulation, operating systems

Changho Kim, data base systems, queueing theory

Randy B. Pollack, study of algorithms, artificial intelligence, programming languages

Mateen M. Rizki, modeling, simulation, biological information processing

Thomas A. Sudkamp, intelligent systems, automated reasoning, mathematical logic

### Admission

Students may be admitted to the graduate programs in computer science and engineering with a baccalaureate degree in computer science, computer engineering, or related areas of appropriate experience, satisfaction of the admission requirements as set forth by the School of Graduate Studies, and a record that indicates potential for a career in computer science and/or computer engineering research.

For the Master of Science in computer science program, students should come to the program with a knowledge of a higher-level language, data structures, concurrent programming, computer organization, formal languages, operating systems, and computer systems design. It may be possible to make up minor background deficiencies after admission to the program by taking appropriate courses.

The Master of Science in computer engineering program requires students to have a knowledge of a higher-level language, data structures, concurrent programming, computer organization, operating



systems, and computer systems design and electronics. They must have equivalent of an ABET-accredited baccalaureate program in engineering. It may be possible to make up minor background deficiencies after admission to the program by taking appropriate courses.

All Ph.D.-seeking students who come to Wright State University without a master's degree will complete the requirements for the M.S. degree as a first phase of their Ph.D. program. The thesis will be used in part to judge the student's potential for independent research. Eligibility to continue the program will be based in part on performance in the M.S. program. Students should, however, anticipate the total requirements of the Ph.D. program when choosing their M.S. program of study. Students entering the program with a Master of Science degree will be required to demonstrate potential for independent study. The mechanism for this will be specified by the department and the General Examination Committee on an individual basis.

## Facilities

The program is supported by an IBM 370/3083, two VAX 11/785s, a VAX 750, and a Sun time-share facility, together with Sun, VAX, Apollo, and PC work stations connected in a local area network with external access. There is also remote access to a supercomputer. The program has laboratories that support studies in artificial intelligence, concurrent programming, control/robotics, digital communications, graphics, operating systems, computer-aided design, digital design, VLSI, software engineering, and optics. The graduate research programs are conveniently located in the Wright State University Research Building at the Miami Valley Research Park.

## Research

Current faculty research projects include applications of artificial intelligence, functional programming, robotics, distributed processing systems, local communication networks, interactive graphics, and computer control systems. Research support is solicited from federal agencies, military agencies, and local industries.

Dissertation research could be related to one of the ongoing research projects or some other problem of mutual interest to the student and a faculty member.

Research at Wright State University is not limited to on-campus laboratory facilities. Several industrial laboratories, Wright-Patterson Air Force Base laboratories, and the Center for Artificial Intelligence Applications are involved in joint research efforts with the university and have unique facilities that are available for faculty and graduate research.

## Graduate Assistantships

Teaching assistantships are available on a competitive basis for students who have established strong academic credentials and can demonstrate good communication skills and teaching potential. Students receiving doctoral teaching assistantships will be supported for the full seventeen quarters of the program contingent upon satisfactory teaching and academic performance. They will be assigned teaching responsibilities for the first nine quarters of the program.

The availability of research assistantships is dependent upon program and faculty research grants and contracts. Students in the Ph.D. program will usually be supported on a research assistantship only after they have passed the General Examinations.

An industrial assistant is a Ph.D. student sponsored by an external organization. The sponsoring organization supports the student by funding tuition and compensation for approximately twenty hours of work per week. The organization will also fund the student during the residency period when the student is working full time on the dissertation. Industrial assistants are recommended for appointment by the organization, but must meet the program's admission standards and continue to make satisfactory progress in the program.

## Degree Requirements

### Master of Science Degree in Computer Science

Requirements for the Master of Science degree in computer science are a department-approved program that must include the following:

- 1 Completion of a minimum of forty-eight graduate credit hours in an approved program of study.
- 2 Completion of at least twenty-four credit hours of nonthesis credit in courses available to graduate students only (700–800 level courses).
- 3 Completion of four credit hours minimum from each of four specified categories:
  - A Programming Languages (principles of programming languages, compilers, software design, proving programs correct, form semantics): CS 680, 780, 781, 784, 785
  - B Systems (operating systems, performance evaluation, architecture, microcomputers, communications, real-time systems): CS 730, 731; CEG 621, 720, 721, 750, 751
  - C Theory (formal languages, theory of computation, combinatorics, graph theory, algorithms, numerical analysis): CS 610, 658, 666, 716, 717, 718, 740, 741



- D Applications (databases, artificial intelligence, simulation, graphics, pattern recognition, management of software systems): CS 605, 607, 670, 701, 710, 711, 735; CEG 676, 677
- 4 Satisfactory completion of a thesis. The level of sophistication must be approximately that expected of a computer science professional in an area in which the student is seeking preparation. The student will be examined orally by a committee concerning the thesis.
- 5 Completion of a maximum of nine credit hours of CS 799 and three hours of CS 700, which may be counted toward the forty-eight credit hours required for the degree.

### **Master of Science in Computer Engineering Degree**

The requirements for the Master of Science in Computer Engineering degree are a department-approved program that must include the following:

- 1 Completion of a minimum of forty-five graduate credit hours in an approved program of study.
- 2 Completion of at least twenty-two credit hours of nonthesis credit in courses available to graduate students only (700–800 level courses).
- 3 Completion of the following core courses:  
CS 730 Systems Programming  
CEG 720 Computer Architecture  
CEG 750 Microprocessors  
ESE 649 Pulse and Digital Circuits  
ESE 701 Linear Systems I
- 4 Completion of a concentration of courses in a computer engineering area or a closely related area.
- 5 Satisfactory completion of a thesis. The level of sophistication must be approximately that expected of a computer engineering professional in an area in which the student is seeking preparation. The student will be examined orally by a committee concerning the thesis.
- 6 Completion of a maximum of ten credit hours of CEG 700, 795, and 799, which may be counted toward the forty-five credit hours required for the degree.

### **Doctor of Philosophy Degree in Computer Science and Engineering**

The Ph.D. program consists of two phases. The first phase, which may be taken on a part-time basis, requires approximately two years of study beyond the baccalaureate degree and culminates with the General Examinations. Those who pass the exams may then begin the research phase, which requires another two years.

The requirements of the program are as follows:

- 1 Completion of eighty graduate credit hours of formal courses in an approved program of study including:
  - A sixty hours in courses available to graduate students only.
  - B twelve hours of graduate courses in mathematics.
  - C reading competency in a second natural language to provide desirable background for theory and practice with computer languages.
  - D core courses in computer architecture, systems programming, theory, and either programming languages or analysis.
- 2 A concentration that provides adequate preparation to conduct state-of-the-art research in a chosen dissertation area and to practice continuing research in computer science and engineering.
- 3 Continuous enrollment in the computer science and engineering seminar.
- 4 Satisfactory completion of a master's thesis. The student will be examined orally by a committee concerning the thesis. The quality of the student's thesis work will be a primary factor in determining his or her potential for acceptable dissertation work.
- 5 Passing the Ph.D. General Examinations. Students may take the Ph.D. General Examinations after completing the master's thesis and obtaining the strong recommendation of three faculty members. The written examination consists of a four-hour test in each of the following four areas: computer architecture, software systems, theory, and either programming languages or analysis. Students passing all four tests must then complete an oral examination.
- 6 Passing the Ph.D. Candidacy Examination. The student must file a written plan of study, submit a written proposal for a dissertation topic, and pass an oral examination on a specific area of study and recognized support areas.
- 7 Ph.D. candidates must spend at least one calendar year in residence enrolled full time for dissertation work. (Some portions of this time may be spent in approved assignments at remote sites.)
- 8 Completion of a Ph.D. dissertation, and successful defense of the dissertation in an oral exam conducted by a dissertation committee.

## **Counseling, School**

See Education and Human Services



## Curriculum and Supervision

See Education and Human Services

## Earth Science

See Geological Sciences

## Economic Education

The Center for Economic Education offers courses designed for the special needs of kindergarten through twelfth grade teachers and administrators. Each course helps participants develop understanding of economics principles and concepts and demonstrates materials and methods useful in teaching the K-12 curricula. Participants are challenged to develop teaching units for their classrooms or schools.

Although graduate credit is awarded for these courses, this credit may not be applied toward the M.B.A., M.S. in logistics management, or M.S. in social and applied economics degrees.

## Economics

The Department of Economics offers a professionally oriented and multidisciplinary graduate program that leads to a Master of Science degree in social and applied economics.

This program is designed to bridge the gap that exists between research and the application of research in developing public policies for the solution of contemporary economic and social problems. Students are encouraged to develop and evaluate new approaches to problem solving in our society. Research and field experience are stressed.

### The Graduate Faculty

#### *Professors*

Norman Anon (Emeritus), consumer economics

John P. Blair, urban and regional economics, economic policy

Mark Z. Fabrycy, economic theory, econometrics, applied economics, forecasting

Rishi Kumar, international economics, economics of development, comparative economic systems, economic theory, monetary and fiscal policy

Robert Premus, regional-urban economics, public finance, economic theory, monetary economics

Stephen M. Renas, cost-benefit analysis and public project evaluation, macroeconomics, monetary theory, environmental economics, financial institutions and markets

G. Thomas Sav (chair), microeconomics, public finance, energy economics, property rights

John J. Treacy, economic theory, public finance, socioeconomic data bases

#### *Associate Professors*

Charles H. Blake, Jr., political economy, human resources, and collective bargaining

Rudy Fichtenbaum, labor economics, macroeconomics, health economics

James A. Swaney, history of economic thought, methodology, environmental and resource economics

#### *Assistant Professors*

Tran Huu Dung, microeconomics, international economics, physical economics

Hushang Shahidi, economic development, international economics, monetary economics

### Admission

An application for graduate study in the Social and Applied Economics program is required to meet the general requirements of the School of Graduate Studies and also to be accepted by the Graduate Studies Committee of the Department of Economics. Students need not have an undergraduate degree in economics to enter this program. The Graduate Record Examination General Test is required.

Application forms for admission and for the Graduate Record Examination are available in the office of the chair of the Department of Economics or from the School of Graduate Studies. Both full- and part-time students are accepted for admission to the program.

### Financial Assistance

Financial assistance is available through the School of Graduate Studies and the Department of Economics. Research graduate assistantships permit students to work with the faculty on both applied and theoretical research projects. Paid internships also provide financial support for graduate students.

### Degree Requirements

Candidates for the Master of Science degree in social and applied economics must successfully complete a minimum of forty-eight credit hours in courses numbered 600 or above, exclusive of prerequisite survey courses. Of the total forty-eight hours, thirty-nine must be taken in the department (twenty-seven credit hours of courses plus twelve credit hours of internship). Students must achieve a



cumulative grade point average of 3.0 in all graduate courses exclusive of the internship, which requires a grade of pass. No more than nine hours of C grades may be applied toward the degree.

The Graduate Studies Committee of the Department of Economics may require a student to take and pass a comprehensive written and/or oral examination as a degree requirement.

As many as twelve graduate credit hours may be transferred into the M.S. program in social and applied economics by petition to the Graduate Studies Committee in the Department of Economics and subject to approval by the School of Graduate Studies.

All candidates are required to complete an internship. Prior to the internship, students should have completed a minimum of twenty-four credit hours (including MS 715 and EC 609). Approval by the student's adviser and the Graduate Studies Committee of the department is also required. Detailed information on internship objectives, standards, and supervision is available upon request from the director of graduate programs in business and economics.

### Prerequisites

Students do not need to have earned a bachelor's degree in economics prior to entering the program; however, basic courses in economics principles, introductory statistics, and calculus are minimum requirements. Students who have not had these courses or their equivalent should complete them before entering the program. Upon approval of the Graduate Studies Committee of the Department of Economics, students may make up deficiencies in program prerequisites after admission to the program but before taking courses requiring these specific prerequisites. The following survey courses have been designed to meet the program prerequisites: MS 621 (for calculus), MS 622 (for statistics), and EC 621 and 622 (for principles of micro- and macroeconomics).

### Program of Study

Any modification of the following program requirements requires petition approval by the department, college, and university graduate studies committees.

Required Courses	36
EC 715 Applied Microeconomics	3
EC 717 Applied Macroeconomics	3
EC 721 Contemporary Political Economy	3
EC 725 Economic and Social Systems I	3
MS 715 Statistical Methods for Business Decisions	3
EC 609 Applied Econometrics	3
EC 780 Economic Problems Seminars	6
EC 760 Internship*	12

Electives	12
Economics	6-12
Noneconomics	0-6
Total	48

\*Students may serve the internship with a private or public institution, participate in a faculty research project, or, with the approval of the department, develop an individual field research project.

### Dual Degree with M.B.A.

Students may obtain both the Master of Business Administration degree and the Master of Science degree in social and applied economics under the dual degree program, which permits common course work to apply to both programs. Students who complete the M.B.A. degree at Wright State may transfer up to eighteen hours to apply to the requirements of the M.S. program, as long as all M.S. program courses are completed within the time limit set for completion of graduate degree programs. This policy does not apply to students who receive an M.B.A. degree from schools other than Wright State. For further information, contact the director of graduate programs in business and economics.

## Education and Human Services

The College of Education and Human Services offers programs leading to graduate degrees in the following areas: art therapy (M.A.T.); educational leadership, with programs in curriculum and supervision (M.A., M.Ed.) and school administration (M.A., M.Ed.); human services with programs in counseling (M.A., M.S.), rehabilitation counseling (M.R.C.), and student personnel services (M.A., M.S., M.Ed.); and teacher education, with a classroom teacher program (M.A., M.Ed.) that includes a variety of concentrations in elementary, middle school, and secondary education, and specialized areas in K-12 such as art, physical education, reading, and special education. Concentrations in these programs are listed in the graduate programs section in the first chapter and are described in detail in the following pages.

Wright State also offers a post-master's degree program leading to the educational specialist (Ed.S.) degree jointly with the University of Dayton. In addition, Wright State has cooperative arrangements with Indiana University for students to earn an Ed.D. degree in school administration and counselor education, and with Bowling Green State University for the Ph.D. in educational administration and supervision.



## The Graduate Faculty

### *Professors*

- Oris E. Amos, special education  
 Gary C. Barlow, art therapy, art education  
 Carl V. Benner, mathematics education  
 Marlene Bireley, school psychology, special education  
 William E. Brown, evaluation, educational psychology  
 Beatrice F. Chait (Emerita), elementary education, language arts, reading  
 William E. Collie, social studies education  
 James A. Dillehay, educational administration, statistics/research  
 Robert D. Earl (Emeritus), science education  
 Diane E. Frey, counselor education  
 Frederick J. Gies, educational administration  
 Glenn T. Graham, education statistics/research  
 T. Stevenson Hansell, reading, language arts  
 Lilburn Hoehn, curriculum, supervision  
 Wesley Huckins (Emeritus), counselor education  
 Roger G. Iddings, science education  
 Robert Medcalf, educational administration  
 L. Tyrone Payne, educational psychology  
 R. A. Pendergrass, curriculum, supervision  
 Lewis K. Shupe, art therapy  
 Harold Silverman, counselor education  
 Ralph E. Stuckman, educational administration, curriculum  
 Alice K. Swinger, language arts  
 James K. Uphoff, social studies education, curriculum, supervision  
 Mary Lou White, children's literature, language arts

### *Associate Professors*

- Gregory R. Bernhardt, counselor education  
 Larry L. Chance, reading, language arts  
 Robert L. Clark, educational foundations  
 Doris E. Dittmar, early childhood education  
 S. Joseph Emanuel, Jr., counselor education  
 Harry C. Ertel (Emeritus), business education  
 Stephen D. Frederick, physical education  
 Larry D. Isaacs, physical education  
 Alyce E. Jenkins, rehabilitation education  
 Mary Ann Jones, counselor education  
 Mary F. Landers, special education  
 Bonnie K. Mathies, library and communication science  
 Vincent Presno, curriculum

Ruth B. Schumacher, educational psychology, counselor education

Gerald P. Sturm, curriculum, supervision

Barbara F. Tea, teacher education

Charles L. Willis, educational administration

Dorothy R. Winkeljohn, science education

Joseph A. Young, curriculum, supervision

### *Adjunct Associate Professor*

Darold Engebretson, counselor education

### *Assistant Professors*

- Michael W. Campanelli, art therapy  
 Deborah R. Golub, art therapy  
 Jan La Forge, rehabilitation counseling  
 Marjorie Pappas, library and communication science  
 Roberta L. Pohlman, physical education  
 Eileen F. Self, counselor education

## Admission

In addition to meeting the requirements for admission as established by the School of Graduate Studies, candidates for these degrees must submit satisfactory Graduate Record Examination (GRE) or Miller Analogies Test (MAT) scores.

All students considering graduate level courses in education and human services should do so with the understanding that graduate study differs in quality from undergraduate study. Graduate study requires that students be increasingly self-directed. It should be noted that students are not guaranteed a master's degree by attending and completing courses, as exit requirements must be met in all programs.

Procedures for admission to the College of Education and Human Services are determined by the candidate's written statement of purpose and undergraduate cumulative grade point average and the submission of satisfactory scores on either the MAT or the aptitude portion of the GRE. (Grade point averages are based on a 4.0 grading system.) Candidates with an average of less than 2.3 are not admitted to graduate school. Candidates for admission to the Division of Human Services must meet additional requirements. Candidates for admission to certain programs in the Division of Teacher Education must meet additional requirements.

## Conditional

Students who have an undergraduate grade point average of 2.5 or better, or who have an average between 2.3 and 2.5 with 2.7 or better in the last half of undergraduate work, are granted conditional admission.

After successful completion of twelve hours of course work with a grade of B or better in each course, regular admission to the College of Education and Human Services is granted.



## Unclassified Undergraduate

Under this alternative admission procedure, students must complete twelve credit hours of upper-level undergraduate courses approved in advance by the college's Office of Student Services. These undergraduate courses will not apply toward work for the master's degree. After completing the twelve hours with a grade of B or better in each course, students are admitted to the nondegree category.

## Certification Candidate

Students who wish to complete certification requirements at the graduate level but do not wish to pursue a graduate degree may be admitted as certification candidates.

## Special Status

Persons who have a bachelor's degree may enroll in certain workshop courses for graduate credit without being admitted to a graduate program. Only a limited number of such credits may be applied later to a degree program if they are appropriate.

## Degree Requirements

### Master of Arts

The Master of Arts in education may be obtained in almost all of the programs offered by the College of Education and Human Services. This is a thesis degree, consisting of a minimum of forty-five credit hours, including nine hours of thesis credit.

For students pursuing the M.A. degree with a major in art education, required courses include fewer studio and elective hours, and nine hours of thesis credits.

Each graduate degree student will be assigned an adviser upon admission as a degree student. The student is required to consult with the adviser to plan the program of study during the first quarter of graduate study and to review the procedure for admission to candidacy.

### Master of Art Therapy

The Master of Art Therapy (M.A.T.) program offers course work and clinical/internship experiences for the person preparing to become an art therapist.

Students gain experience in this health-related profession by working in both on- and off-campus settings with clients who have emotional, motor, and perceptual problems or other dysfunctions. Emphasis is placed in the expressive, learning, and adjustive aspects of art therapy.

Admission requirements include three letters of recommendation, an interview, and a portfolio of art work. Additional information may be obtained from the office of the art therapy program coordinator.

In the M.A.T. program, students have a choice of three program exit options: a thesis, a project, or extended clinical hours. A minimum of 600 clinical hours is included in the M.A.T. program.

### Master of Education

The Master of Education (M.Ed.) degree is awarded only to those individuals qualified for at least a provisional teaching certificate. Individuals who have degrees in disciplines other than education, and who are not qualified for a provisional certificate, can obtain Ohio certification in either elementary or secondary education concurrently with the master's degree. Such programs are individualized and must be approved by the College of Education and Human Services.

A program of concurrent degree and certification work typically will require more course work than the standard master's degree program, and may necessitate the individual's taking undergraduate courses. These undergraduate courses apply to certification requirements, but do not apply as graduate credit toward a master's degree.

The M.Ed. degree may be obtained by following one of three patterns: either by completing (a) a minimum of forty-eight credit hours of course work, (b) a minimum of forty credit hours of course work, plus five credit hours of a research project, or (c) fifty-eight or fifty-nine credit hours to receive the M.Ed. in school counseling. For students writing a research project, the oral defense of the project constitutes the major emphasis of the final evaluation. The examining committee will consist of two members of the graduate faculty selected by the student and adviser.

Each graduate degree student will be assigned an adviser upon admission to the college. The student is required to consult with the adviser to plan the program of study during the first quarter of graduate study and to review the procedure for admission to candidacy.

### Master of Science

The Master of Science (M.S.) degree in counseling and guidance offers concentrations in six specialties: mental health counseling, business and industrial counseling, gerontological counseling, marriage and family counseling, counseling exceptional children, and student personnel services in higher education.

Admission requirements include three letters of recommendation and an interview. The Master of Science degree may be obtained by following one of two patterns: either by completing (a) a minimum of sixty credit hours of course work, or (b) a minimum of fifty-five credit hours plus five hours of a research project.



Each graduate degree student will be assigned an adviser upon admission to the college. The student is required to consult with the adviser to plan the program of study during the first quarter of graduate study, and to review the procedure for candidacy.

### **Master of Rehabilitation Counseling**

The Master of Rehabilitation Counseling (M.R.C.) program offers training and course work designed to develop skills in the holistic counseling process. The program prepares students for work within a wide variety of settings and students may choose to specialize in either the rehabilitation of the severely disabled or the rehabilitation of the chemically dependent. Students who choose the rehabilitation of the severely disabled concentration may elect to do an internship with a special population for intensive study. Admission requirements include three letters of recommendation and an interview.

### **Educational Specialist**

The Educational Specialist (Ed.S.) program is an advanced (post-master's) degree program in educational leadership for individuals who have career interests in superintendency or central office administration.

### **Final Evaluation for Programs**

For students in the M.A. programs, the oral defense of the thesis constitutes the major emphasis of the final evaluation. The examining committee will consist of three members of the graduate faculty selected with the student's adviser.

For students in the M.Ed. and M.S. programs, the final evaluation varies according to the program. Final evaluation processes and procedures for specific programs may be obtained either in the college's Office of Student Services or from the program coordinator. M.R.C. students must have a minimum of a B grade in their internship and complete an end of program project.

Should the student fail to pass the final evaluation, the student and adviser will plan a program of study in preparation for reevaluation. Such a program could include independent study, further course work, or both. As a result, the quarter hour requirements for the degree may also be increased. Students may retake all or any part of the final evaluation a maximum of three times.

### **Thesis and/or Project Procedures**

Students planning to write a thesis or do a research project in partial fulfillment of the requirements for master's degree should do the following:

- 1 Complete ED 751 and ED 752.
- 2 Prepare a preliminary thesis or project proposal following the college outline for proposals. This proposal is to be developed with the assistance of the faculty adviser.
- 3 Establish a thesis or project committee. It is customary, although not required, for a student's adviser to be a member of the committee. The remainder of the committee may include persons in education or other disciplines and should be chosen as resource persons relative to the research. The function of the committee is to facilitate the student's progress toward completing the proposal, conducting the study, and preparing the final report or thesis. Further, the committee serves as the primary source of evaluation of the student's oral defense.
- 4 Upon completion of the oral defense, submit one bound copy, following the style manuals of the College of Education and Human Services and School of Graduate Studies, of the final project or thesis to the college's Office of Student Services. The outline for thesis and project proposals may be obtained from the college's Office of Student Services.

## **Educational Specialist Degree**

### **Major Nos. 298 and 299**

Wright State University offers an advanced program leading to the Educational Specialist degree (Ed.S.) in the area of educational leadership for individuals who have career interests in superintendency or central office administration. The Ed.S. degree is a terminal degree for educators preparing for positions requiring a higher level of competence and specialization than that of the master's degree. A planned program of study will typically cover two years, with a required minimum of forty-five quarter hours of graduate work beyond the master's degree. In this program, work may be completed at either Wright State University or at the University of Dayton. The degree is an intermediate degree between the M.Ed. and the Ph.D. Selected Ed.S. students may transfer course work to doctoral programs that are offered cooperatively with Bowling Green State University and Indiana University.

### **Purpose**

The growing complexity of the educational enterprise has created a need for persons with additional training for public and private schools, federally and state-funded programs, and private foundations. This Ed.S. program is designed to enhance the individual capabilities for leadership in the roles of superintendents, assistant superintendents, supervisors, and principals. The program emphasizes the achievement of



competence in such concepts as leadership, institutional change, decision making, organizational structure and theory, and communication processes. Further, the program focuses upon the development of broad understanding and experiences across the professional field, the acquisition of in-depth knowledge in one specific area of educational leadership, the acquisition of concepts from related fields of knowledge, and a planned field experience which will integrate the concepts, skills, and attitudes acquired in formal course settings.

Admission to the education specialist degree program is based on the following criteria:

- 1 Three letters of recommendation from persons who know your work
- 2 Graduate Record Examination\*
- 3 Cooperative English Test
- 4 Appropriate experience
- 5 Interview with members of the Education Leadership faculty
- 6 A grade point average of 3.5 in previous graduate work
- 7 Minimum undergraduate grade point average requirement as specified by the School of Graduate Studies.

\*Miller Analogies Test is accepted for students not planning to transfer to a doctoral program.

## Program

The planned program of study will be individually arranged and will consist of a minimum of forty-five quarter hours of graduate work beyond the master's degree.

Required Courses	40
ED 871 Management of the School	3
ED 872 Staff Personnel Administration	3
ED 873 Pupil Personnel Administration	3
ED 874 School Business Management and Facilities	3
ED 971 Superintendent/Staff/Board Relationships	3
ED 972 Ideas in Education	3
ED 986 Organizations as Social Systems	4
ED 987 Administrative Leadership Skills	3
ED 899 Thesis	3
ED 991 Advanced Seminar in Educational Leadership	3
ED 974 Seminar in Educational Leadership	3
ED 890 Practicum in School Administration	3
ED 988 Research and the Educational Leader	3
Cognates/Electives	5
<b>Total</b>	<b>45</b>

Note: This is a sample program appropriate for those who want the Ed.S. degree and the Ohio Superintendent's certificate (major no. 299). Those who fall into one of the following three categories must complete a different program:

- 1 Those who desire enrollment in the cooperative doctoral program with Bowling Green State University.
- 2 Those who desire a curriculum and instruction concentration (major no. 298).
- 3 Those who have not completed prerequisites in educational administration.

## Classroom Teacher Program

The classroom teacher program leads to a Master of Education degree for individuals who are qualified for a provisional teacher certificate, or a Master of Arts degree for persons who plan to do research and a thesis. The purpose of this program is to enhance the effectiveness of the teacher through the development of new skills and the enrichment of existing skills, to add to content knowledge in the teacher's teaching fields, or, in some cases, to add new certification areas.

The classroom teacher program consists of nineteen concentrations: art; business; certification, elementary; certification, secondary; computer education; early childhood; general; physical education (HPR); international literature for children and young people; library/media; mathematics; reading; science; special education—multiply handicapped (MH); special education—specific learning disabilities (SLD); special education—severe behavior handicapped (SBH); special education—developmentally handicapped (DH); special education—orthopedically handicapped (OH); and special education—gifted.

## Classroom Teacher: International Literature for Children and Young People Major No. 245

This major is designed to extend knowledge of international literature for children and young people, to build skills of scholarship, and to develop a global perspective toward children and books. The courses are planned for teachers, school media specialists, and other students interested in a strong literary program. Graduates will be prepared to teach literature-based programs in elementary and secondary schools, to work in trade book publishing, to do certain aspects of library service, to serve as literary critics, and to participate internationally in the field of literature for children and young people.

Introductory Course Work	12
ED 751 Educational Statistics and Research	5
ED 747 Leadership for School Improvement	4
ED 711 Foundations of International Education	3
Professional Requirements	11
ED 734 Analysis of Teaching	4
ED 791 Curriculum Design and Evaluation	4
ED 721 Literature for Elementary Children or LCS 663 Literature for Adolescents and Young Adults	3



## 72 Programs/Education and Human Services

<b>Program Concentration</b>	<b>15</b>
ED 810/820 Seminar in Elementary/ Secondary Education	3
ED 739 Cultural Studies in Literature for Children and Young People (titles vary)	3
ED 748 Teaching Literature to Children and Young People	3
ED 737 Survey of World Literature for Children and Young People	3
ED 745 Genre Studies in International Literature for Children and Young People (titles vary)	3
<b>Electives</b>	<b>9-10</b>
<b>Total</b>	<b>48-49</b>

### Classroom Teacher: Business Major No. 248

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research**	5
<b>Professional Requirements</b>	<b>11</b>
ED 734 Analysis of Teaching	4
LCS 649 Introduction to Instructional Media	3
ED 820 Seminar in Secondary Education: Business Education***	4
<b>Program Concentration</b>	<b>24-29</b>

#### Business Education Core:

ECO 500 Consumer Economics for K-12 Teachers	3
ED 724 Foundations of Business Education	3
ED 824 Curriculum Development for Vocational Business and Office Education**	3

#### Five courses to be selected from the following:

ED 606 Survey of Vocational Education**	3
ED 607 Cooperative Office Education	3
ED 608 Intensive Office Education	3
ED 633 Business Education Curriculum and Materials: Basic Business Subjects	4
ED 634 Business Education Curriculum and Materials: Typewriting, Keyboarding, Word Processing, and Office Procedures	4
ED 635 Business Education Curriculum and Materials: Shorthand, Transcription, and Secretarial Procedures	3
ED 725 Administration and Supervision in Vocational Education**	3
ED 726 Adult Programs in Vocational Education*	3
ED 727 Teaching Strategies and Curriculum Trends in Nonskilled Business Education Subjects	3

ED 729 Teaching Strategies and Curriculum Trends in Accounting and Data Processing	3
ED 730 Teaching Strategies and Curriculum Trends in the Skilled Business Education Subjects	3
ED 825 Facilities and Management of Vocational Business and Office Education**	3
ED 826 Coordination Techniques for Vocational Business and Office Education**	3
ED 827 Evaluation of Vocational Business and Office Education*	3
ED 828 Teaching Strategies and Equipment Adaptations for Disadvantaged and Handicapped Students in Business and Office Education*	3
LCS 685 Computers for Educators	3
LCS 686 Applications of Computers in Education	3
LCS 687 Introduction to BASIC for Educators	4
<b>Total</b>	<b>48-53</b>

\*Courses are approved for vocational education supervisor's certificate.

\*\*Courses are required for vocational education supervisor's certificate.

\*\*\*Required of all master's degree students; to be taken toward the end of the program.

### Classroom Teacher: Art Major No. 250

The classroom teacher program in art may be used to enhance leadership or studio skills for improvement of classroom teaching. This program may also prepare students for instructional roles in museums and other nonschool settings.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>11-12</b>
ED 734 Analysis of Teaching	4
ED 791 Curriculum Design and Evaluation	4
<b>One of the following:</b>	
ED 710 Classroom Strategies for Atypical Populations	4
ED 784 Legal and Professional Issues	4
LCS 649 Introduction to Instructional Media	3
<b>Program Concentration</b>	<b>23-24</b>
AED 731 Theories and Philosophies in Art Education	4
AED 752 Research in Art Education	4



15–16 hours selected by student and adviser from the following:

AED 623 Fibers and Fabrics	4
AED 624 Weaving	4
AED 625 Textiles	4
AED 626 Creative Stitchery	4
AED 636 Minor Problems in Art Education	1–4
AED 637 Minor Problems in Art Education	1–4
AED 641 Art Appreciation and Criticism in the School	4
AED 642 Advanced Problems in Art Education	3
AED 643 Architectural and Environmental Awareness	4
AED 770 Independent Study	1–3
<b>Total</b>	<b>48–49</b>

### Classroom Teacher: Early Childhood Major No. 251

Early childhood education at Wright State University focuses on experiences with young children and the production and use of creative resources for teaching. Early childhood education students interact with children, and the emphasis is on individualization of instruction and a variety of materials and experiences for multicultural/multiethnic children. Students are trained for employment in industrial, business, parochial, private, and public programs.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>11</b>
ED 734 Analysis of Teaching	4
ED 710 Classroom Strategies for Atypical Populations	4
ED 810 Seminar in Elementary Education: Early Childhood	3
<b>Program Electives</b>	<b>24</b>
Selected from the following:	
ED 609 Early Childhood Curriculum and Materials: Sociocultural	4
ED 611 Early Childhood Education*	4
ED 612 Kindergarten: Curriculum and Materials*	4
ED 614 Early Childhood Education Curriculum and Materials: Language	4
ED 658 Practicum in Education	3–6
ED 670 Curriculum and Instruction Workshop	3–6
ED 713 Working with Parents of Young Children	3
ED 714 Creativity and Self-Concept of the Young Child	3

ED 715 Role of Administrator in Early Childhood Education	3
ED 717 Early Childhood Curriculum and Materials: Mathematics and Science Readiness	3
ED 770 Independent Reading and Minor Problems	3
<b>Total</b>	<b>48</b>

\*An elementary teacher's certificate may be validated for kindergarten teaching following successful completion of ED 613 and either ED 611 or ED 614.

### Classroom Teacher: General Major No. 252

The general classroom teacher program is designed for elementary and secondary teachers who desire additional preparation in a field or area not offering a specialized program or certificate. This program offers a more flexible option for highly motivated persons who seek a master's degree with a specific professional objective, such as additional course work to update knowledge or skills in the content field. Twelve hours may be taken either in advanced professional studies or in courses offered outside the College of Education and Human Services in a teaching discipline.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>23</b>
ED 734 Analysis of Teaching	4
ED 791 Curriculum Design and Evaluation	4
ED 710 Classroom Strategies for Atypical Populations	4
ED 784 Legal and Professional Issues	4
LCS 649 Introduction to Instructional Media	3
ED 820 Seminar in Secondary Education*	4
<b>Program Electives</b>	<b>12</b>

Twelve hours to be chosen by student and adviser. Electives may be selected from courses offered by the College of Education and Human Services or one of the other colleges offering appropriate graduate courses. For example, courses may be chosen in the areas of English, math, religion, science, social studies, student learning and behavior, or other special-interest fields.

<b>Total</b>	<b>48</b>
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\*To be taken near the end of the program



### Classroom Teacher: Reading Major No. 255

The reading program is designed to aid the classroom teacher in helping students improve reading and thinking skills. The program leads to a validation of a standard elementary certificate for a K-12 reading teacher. Opportunities for graduates of this program include classroom teaching, tutoring in a variety of settings, and work in training departments in business and industry.

This major could also lead to supervisory positions for the coordination and improvement of school or district-wide reading programs. Upon completion of this program, an additional course (ED 776, Supervision of Instruction and Personnel, 3 credit hours), and evidence of at least twenty-seven months of successful classroom teaching experience under a standard teacher's certificate, a person may qualify for an Ohio provisional reading supervisor's certificate.

Introductory Course Work		13
ED 704 Introduction to Foundations of Education	4	
ED 747 Leadership for School Improvement	4	
ED 751 Educational Statistics and Research	5	
Professional Requirements		11
ED 734 Analysis of Teaching	4	
ED 791 Curriculum Design and Evaluation	4	
ED 716 Foundations of Reading Instruction	3	
Program Concentration		18-19
ED 721 Literature for Elementary Children or LCS 663 Literature for Adolescents and Young Adults	3	
ED 654 Administration and Interpretation of Educational Data	3	
ED 656 Clinical Practice in Remediation	4	
ED 815 Teaching Children to Write	3	
ED 769 Content Reading Instruction Grades 4-12	3	
ED 810 Seminar in Elementary Education: Reading	3	
Electives		4-5
Total		48-49

### Classroom Teacher: Special Education Developmentally Handicapped (DH) Major No. 257

This program leads to certification in developmentally handicapped education for the holder of an elementary education teaching certificate. Persons who do not hold an elementary education teaching certificate should check with the teacher certification adviser in the Office of Student Services for the necessary prerequisites before beginning this program.

Introductory Course Work		13
ED 704 Introduction to Foundations of Education	4	
ED 747 Leadership for School Improvement	4	
ED 751 Educational Statistics and Research	5	
Professional Requirements		6
LCS 685 Computers for Educators or LCS 686 Applications of Computers in Education	3	
ED 850 Seminar in Special Education (to be taken at end of program)	3	
Program Concentration		34-35
ED 651 Nature and Needs of the Multiply Handicapped (offered fall only)	3	
ED 655 Nature and Needs of the Mildly Handicapped	4	
ED 654 Administration and Interpretation of Educational Data	3	
ED 642 Curriculum, Methods, and Materials for the Mildly Handicapped	4	
ED 656 Clinical Practice in Remediation	4	
ED 644 Instructional and Behavioral Management of Exceptional Individuals	3	
ED 659 Communication and Consultation Skills for Special Educators	3	
ED 645 Career Education and Occupational Training for Exceptional Individuals	3	
ED 658 Practicum in Education: Developmentally Handicapped	6-7	
Total		53-54

### Classroom Teacher: Special Education Specific Learning Disabilities (SLD) Major No. 258

This program leads to certification in learning disabilities for the holder of an elementary education teaching certificate. Persons interested in this program who are not certified elementary teachers should consult with the teacher certification adviser in the Office of Student Services.

Introductory Course Work		13
ED 704 Introduction to Foundations of Education	4	
ED 747 Leadership for School Improvement	4	
ED 751 Educational Statistics and Research	5	
Professional Requirements		6
LCS 685 Computers for Educators or LCS 686 Application of Computers in Education	3	
ED 850 Seminar in Special Education (to be taken at end of program)	3	
Program Concentration		31-32
ED 655 Nature and Needs of the Mildly Handicapped	4	
ED 654 Administration and Interpretation of Educational Data	3	



ED 642 Curriculum, Methods, and Materials for the Mildly Handicapped	4
ED 656 Clinical Practice in Remediation	4
ED 644 Instructional and Behavioral Management of Exceptional Individuals	3
ED 659 Communication and Consultation Skills for Special Educators	3
ED 645 Career Education and Occupational Training for Exceptional Individuals	3
ED 658 Practicum in Education: Specific Learning Disabilities	6-7
<b>Total</b>	<b>50-51</b>

### **Classroom Teacher: Special Education Multiply Handicapped Major No. 259**

This concentration emphasizes the moderately, severely, and profoundly retarded (MSPR), trainable mentally retarded, the autistic, and children and youth with severe physical and mental impairments. It fulfills current standards for certification in MH and the QMRP certification.

Persons interested in this program who are not certified elementary teachers should consult with a teacher certification adviser in the Office of Student Services.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>10</b>
ED 642 Curriculum, Methods, and Materials for the Mildly Handicapped	4
LCS 685 Computers for Educators or LCS 686 Applications of Computers in Education	3
ED 850 Seminar in Special Education (to be taken at end of program)	3
<b>Program Concentration</b>	<b>31-32</b>
ED 651 Nature and Needs of the Multiply Handicapped (offered fall only)	3
ED 652 Education of Individuals with Physical, Sensory, and Motor Disorders (offered winter only)	3
ED 653 Curriculum, Methods, Materials, and Adaptive Equipment for Multiply Handicapped (offered spring only)	3
ED 659 Communication and Consultation Skills for Special Education	3
ED 645 Career Education and Occupational Training for Exceptional Individuals	3
ED 643 Introduction to Augmentative Communication	3
HPR 750 Scientific Foundations for Conditioning	4

ED 644 Instructional and Behavioral Management of Exceptional Individuals	3
ED 658 Practicum in Education: Multiply Handicapped (Students without prior student teaching must do 6 hours of student teaching and 6 hours of practicum)	6-7
<b>Total</b>	<b>54-55</b>

### **Classroom Teacher: Special Education Orthopedically Handicapped (OH)**

This program leads to certification in orthopedically handicapped for the holder of an elementary education teaching certificate. Persons interested in this program who are not certified elementary teachers should consult with a teacher certification adviser in the Office of Student Services.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to the Foundations of Education	4
ED 747 Leadership Skills for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>10</b>
ED 642 Curriculum, Methods, and Materials for the Mildly Handicapped	4
LCS 685 Computers for Educators or LCS 686 Applications of Computers in Education	3
ED 850 Seminar in Special Education (to be taken at end of program)	3
<b>Program Concentration</b>	<b>31-32</b>
ED 651 Nature and Needs of the Multiply Handicapped (offered fall only)	3
ED 652 Education of Individuals with Physical, Sensory, and Motor Disorders (offered winter only)	3
ED 653 Curriculum, Methods, Materials, and Adaptive Equipment for Multiply Handicapped (offered spring only)	3
ED 659 Communication and Consultation Skills for Special Educators	3
ED 645 Career Education and Occupational Training for Exceptional Individuals	3
ED 643 Introduction to Augmentative Communication	3
ED 655 Nature and Needs of the Mildly Handicapped	4
ED 644 Instructional and Behavioral Management of Exceptional Individuals	3
ED 658 Practicum in Education: Orthopedically Handicapped	6-7
<b>Total</b>	<b>54-55</b>



### Classroom Teacher: Special Education Severe Behavior Handicapped (SBH)

This program leads to certification in severe behavior handicapped education for the holder of an elementary education teaching certificate. Persons interested in this program who are not certified elementary teachers should consult with a teacher certification adviser in the Office of Student Services.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to the Foundations of Education	4
ED 747 Leadership Skills for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>6</b>
LCS 685 Computers for Educators or LCS 686 Applications of Computers in Education	3
ED 850 Seminar in Special Education (to be taken at end of program)	3
<b>Program Concentration</b>	<b>40-41</b>
ED 651 Nature and Needs of the Multiply Handicapped (offered fall only)	3
ED 655 Nature and Needs of the Mildly Handicapped	4
ED 654 Administration and Interpretation of Educational Data	3
ED 642 Curriculum, Methods, and Materials for the Mildly Handicapped	4
ED 656 Clinical Practice in Remediation	4
ED 644 Instructional and Behavioral Management of Exceptional Individuals	3
ED 659 Communication and Consultation Skills for Special Educators	3
ED 645 Career Education and Occupational Training for Exceptional Individuals	3
CNL 751 Counseling Skills for Educators	3
Clinical Practice with Severe Behavior Handicapped Individuals	3
ED 658 Practicum in Education: Severe Behavior Handicapped	6-7
<b>Total</b>	<b>59-60</b>

### Classroom Teacher K-12 Special Education/Gifted Major No. 260

This program leads to validation in gifted education to the holder of an Ohio teaching certificate.

<b>Introductory Course Work</b>	<b>13</b>
ED 747 Leadership Skills for School Improvement	4
ED 751 Educational Statistics and Research	5
ED 704 Introduction to Foundations of Education	4

<b>Program Concentration</b>	<b>21-24</b>
ED 722 Gifted Children and Youth (offered fall only)	3
Select one course in computer education (LCS 685, 686, 687, 688, or 781)	3-4
ED 723 Teaching the Gifted (offered winter only)	3
ED 720 Creative Problem Solving in Classrooms (offered spring only)	3
CNL 961 Counseling the Gifted (offered fall only)	3
ED 658 Practicum in Education	3-6
ED 850 Seminar in Special Education	3
<b>Content Concentration</b>	<b>11-15</b>
Courses developing a concentration in advanced instruction/curriculum educational technology/ counseling/education of gifted/handicapped or research selected by student or adviser	
<b>Total</b>	<b>48</b>

### Classroom Teacher: Science Major No. 261

This program enables students to take substantial advanced graduate course work in the sciences in order to update skills and strengthen knowledge in their major teaching field.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>11</b>
ED 734 Analysis of Teaching	4
LCS 649 Introduction to Instructional Media	3
ED 820 Seminar in Secondary Education*	4
<b>Program Electives</b>	<b>24</b>
Twenty-four hours of graduate courses in science taken outside the College of Education and Human Services	
<b>Total</b>	<b>48</b>

\*To be taken near the end of the student's program

### Classroom Teacher: Mathematics Major No. 262

This program enables students to take substantial advanced graduate course work in mathematics in order to update skills and strengthen knowledge in their major teaching field.

<b>Introductory Course Work</b>	<b>13</b>
To be taken in any sequence within first twenty-four credit hours of graduate education course work	
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5



<b>Professional Requirements</b>	<b>11</b>
ED 734 Analysis of Teaching	4
LCS 649 Introduction to Instructional Media	3
ED 820 Seminar in Secondary Education*	4

<b>Program Electives</b>	<b>24</b>
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Twenty-four hours of graduate courses (approved by adviser) in mathematics and related disciplines. These must be taken outside the College of Education and Human Services

<b>Total</b>	<b>48</b>
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\*To be taken near the end of the student's program

### **Classroom Teacher: Secondary Certification** **Major No. 263**

This option is designed for persons with a baccalaureate degree in a field other than education who wish to combine secondary certification with a master's degree in the classroom teacher program. This accelerated program requires a full-time commitment for at least one year, and students must start in the fall quarter.

Applicants should have completed most of the course requirements in a valid teaching field. Additional course work may be necessary in order to meet state certification requirements. The professional sequence consists of three phases. Phase I is an introductory phase that has a strong field component and is completed in the first quarter. Phase II is directed toward curriculum competence and teaching skills in the content area. Phase III combines full-time student teaching with a professional seminar. To complete the master's degree, three additional courses may be taken in any sequence.

Prior to beginning the program, participants must complete an additional application through the college's Office of Student Services. Additional entry and exit requirements apply. Please contact the Office of Student Services.

<b>Introductory Course Work</b>	<b>16</b>
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To be taken concurrently during the first quarter in the program (offered fall quarter only)	
ED 702 Social Foundations of Education	3
ED 710 Classroom Strategies for Atypical Populations	4
ED 662 Studies in the Psychological Foundations of Education	6
ED 666 Introduction to Schooling	3

<b>Professional Requirements: Phase II</b>	<b>15-23</b>
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ED 604 Adolescent Development	3
ED 632 Improving Reading in Secondary Schools	3
ED 663 Teaching Skills and Strategies	3

ED 664 Evaluation (e.g., Specified Curriculum and Materials course)	3
ED 631 Secondary School Science: Curriculum and Materials	3
ED 633 Business Education Curriculum and Materials: Basic Business Subjects	4
ED 634 Business Education Curriculum and Materials: Typewriting, Keyboarding, Word Processing, and Office Procedures	4
ED 635 Business Education Curriculum and Materials: Shorthand, Transcription, and Secretarial Procedures	3
ED 638 Secondary School Mathematics: Curriculum and Materials	3
ED 639 Secondary School Social Studies: Curriculum and Materials	3
ED 623 Secondary School English: Curriculum and Materials	3
ED 624 Secondary School Speech and Drama: Curriculum and Materials	3
ED 625 Modern Foreign Languages: Curriculum and Materials	3

<b>Professional Requirements: Phase III</b>	<b>30</b>
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ED 667 Supervised Teaching: Secondary	13
ED 784 Legal and Professional Issues	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
ED 791 Curriculum Design and Evaluation	4

<b>Total</b>	<b>61-69</b>
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### **Classroom Teacher: Elementary Certification** **Major No. 264**

This option is designed for persons with a baccalaureate degree in a field other than education who wish to combine elementary certification with a master's degree in the classroom teacher program. This accelerated program requires a full-time commitment for at least fifteen months, and students must start in the fall quarter.

The professional sequence consists of three phases. Phase I is an introductory phase that has a strong field component and is completed in the first quarter. Phase II is directed toward developing teaching skills in the elementary curriculum and may be completed in two quarters. Phase III combines full-time student teaching with a professional seminar. To complete the master's degree, three additional courses may be taken in any sequence. Additional course work may be necessary to meet state certification requirements.

Prior to beginning the program, participants must complete an additional application through the college's Office of Student Services. Additional entry and exit requirements apply. Please contact the Office of Student Services.



<b>Introductory Course Work</b>	<b>16</b>
To be taken concurrently during the first quarter in the program (offered fall quarter only)	
ED 666 Introduction to Schooling	3
ED 702 Social Foundations of Education	3
ED 710 Classroom Strategies for Atypical Populations	4
ED 662 Studies in the Psychological Foundations of Education	6
<b>Professional Requirements: Phase II</b>	<b>25</b>
ED 663 Teaching Skills and Strategies	3
ED 603 Child Development	3
ED 615 Improvement of Elementary Reading Instruction	3
ED 616 Improving Science Instruction in the Elementary School	3
ED 617 Elementary Social Studies: Curriculum and Materials	3
ED 637 Elementary School Mathematics: Curriculum and Materials	3
ED 664 Evaluation	3
ED 721 Literature for Elementary Children	3
<b>Professional Requirements: Phase III</b>	<b>30</b>
ED 665 Supervised Teaching: Elementary	13
ED 784 Legal and Professional Issues	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
ED 791 Curriculum Design and Evaluation	4
<b>Total</b>	<b>71</b>

### **Classroom Teacher: Physical Education (HPR)**

#### **Major No. 243**

This concentration is appropriate for physical education teachers who desire to enhance their effectiveness in teaching motor skills, in working with students with special needs, and in understanding various methods of conditioning. This program can benefit those who wish to learn new techniques for assessing physical activity through the use of educational technology such as the computer. It can also aid in applying current research findings to daily teaching practices. These courses can also help coaches who wish to improve their ability to administer interscholastic athletic programs. Physical education teachers and coaches who currently have a master's degree may want to take individual courses to meet special needs.

<b>Introductory Course Work</b>	<b>13</b>
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>12</b>
Twelve hours to be arranged	

<b>Program Concentration</b>	<b>25</b>
HPR 710 Physical Education for Children with Special Needs	4
HPR 720 Motor Development and Acquisition of Motor Skills	4
HPR 740 Administration of Interscholastic Athletics or HPR 760 Advanced Athletic Training Techniques	4
HPR 750 Scientific Foundations for Conditioning	4
HPR 753 Assessment of Physical Activity	4
HPR 780 Research in Physical Education	5
<b>Total</b>	<b>50</b>

### **Educational Leadership Programs**

The programs within educational leadership are designed primarily for those who want to prepare for leadership roles in educational settings. All of the programs lead to new certification except the teacher leader program.

The supervision programs lead to certification as a supervisor in the same area as the individual's teaching certificate. There is no certification in the state of Ohio for curriculum, but the person who wants that emphasis should take the supervision/curriculum program. The other three supervision programs, supervisor/special education, supervisor/computer coordinator, and supervisor/media, offer some specialty courses in conjunction with certification in supervision. Initial certification requires three years of classroom teaching experience under a standard certificate.

The principalship program leads to certification as a school principal in the same level (elementary, secondary) as the individual's teaching certificate. Initial certification requires three years of classroom teaching experience under a standard certificate.

Through the educational administrative specialist program, seven certification areas are available. This program is primarily for persons who desire positions in school district administrative offices. Initial certification requires three years of classroom teaching experience under a standard teaching certificate.

New standards for administrator certificates in the state of Ohio became effective September 1, 1985, and require a minimum of sixty-eight quarter hours of graduate credit. Students will receive, however, a master's degree at the end of 48 hours and will also be eligible for the supervisor's certificate.

The teacher leader program is primarily for teachers who wish to remain in the classroom and combine a teaching improvement program with leadership and curriculum development skills. The program is offered in an off-campus setting only and does not lead to a new certificate.



### Vocational Supervisor

The graduate program for the preparation of vocational educational supervisors is designed to provide schools with competent instructional leadership. The program contains a foundations core, a supervision core, a curriculum and instructional leadership core, and a vocational core. In addition, school law, computer applications for educational leaders, and a clinical field experience are integral program components. Students completing the program will receive a M.Ed. and be eligible to receive a vocational supervisors certificate if they have completed twenty-seven months of successful teaching experience under the appropriate certificates.

### Vocational Supervisor Major No. 287

<b>Introductory Course Work</b>	<b>13</b>
May be taken in any sequence	
ED 704 Introduction to Foundations in Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5
<b>Vocational Core</b>	<b>18</b>
ED 606 Survey of Vocational Education	3
ED 725 Administration and Supervision in Vocational Business and Office Education	3
ED 824 Curriculum Development for Vocational Business and Office Education	3
ED 825 Facilities and Management of Vocational Business and Office Education	3
ED 826 Coordination Techniques for Vocational Business and Office Education	3
ED 790 Practicum in Instructional Leadership	3
<b>Supervision Core</b>	<b>6-7</b>
ED 776 Supervision of Instruction and Personnel	3
or ED 792 Models of Supervision and Staff Development	4
ED 782 School Law	3
<b>Curriculum and Instruction Core</b>	<b>6</b>
ED 773 Curriculum Theory and Practice	3
ED 793 Computer Application for Educational Leaders	3
<b>Electives</b>	<b>4-5</b>
ED 726 Adult Programs in Vocational Business and Office Education	3
ED 775 Leadership for Instructional Improvement	3
ED 791 Curriculum Design and Education	4
ED 827 Evaluation of Vocational Business and Office Education	3

ED 828 Teaching Strategies and Equipment Adaptations for Disadvantaged and Handicapped Students in Business and Office Education	3
<b>Total</b>	<b>48</b>

### Educational Leadership Program Curriculum/Supervision Certification Major No. 288

<b>Introductory Course Work</b>	<b>11</b>
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<i>Administrative Strand: Focus on Administrative Behavior</i>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<i>Curriculum Strand: Focus on Program Development</i>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<i>Instruction Strand: Focus on Instructional Leadership</i>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Curriculum and Supervision Courses</b>	<b>14</b>
ED 782 School Law	3
ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>0-1</b>
<b>Total</b>	<b>49-50</b>

### Educational Leadership Program: With Principalship Certification Major No. 294

<b>Introductory Course Work</b>	<b>11</b>
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5



**Common Educational Leadership Courses 21****Administrative Strand: Focus on Administrative Behavior**

ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3

**Curriculum Strand: Focus on Program Development**

ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3

**Instruction Strand: Focus on Instructional Leadership**

ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3

**Administrative Courses 15**

ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3

**Electives 2-3****Total 49-50****Post-Master's Requirements (Certification)****Concentration Courses 21**

ED 871 Management of the School	3
ED 872 Staff Personnel Administration	3
ED 873 Pupil Personnel Administration	3
ED 874 School Business Management and Facilities	3
ED 890 Practicum in School Administration	3
Cognates (Economics, Political Science, Finance, Communication)	6

**Total 70-71****Educational Leadership Program Supervisor/Special Education Major No. 290****Introductory Course Work 11**

May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Education Statistics and Research	5

**Common Educational Leadership Courses 18****Administrative Strand: Focus on Administrative Behavior**

ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3

**Curriculum Strand: Focus on Program Development**

ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3

**Instruction Strand: Focus on Instructional Leadership**

ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3

**Curriculum and Supervisor Courses 22**

ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
CNL 765 Pupil Personnel Services in the School and Community Resources	4
CNL 857 Practicum in School Psychology	4

**Total 51****Educational Leadership Program: Educational Administrative Specialist with Instructional Service Certification Major No. 280****Introductory Course Work 11**

May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5

**Common Educational Leadership Courses 21****Administrative Strand: Focus on Administrative Behavior**

ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3

**Curriculum Strand: Focus on Program Development**

ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3

**Instruction Strand: Focus on Instructional Leadership**

ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3

**Administrative Courses 15**

ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3



ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>2-3</b>
<b>Total</b>	<b>49-50</b>

### ***Post-Master's Requirements (Certification)***

<b>Concentration Courses</b>	<b>17</b>
ED 872 Staff Personnel Administration	3
ED 890 Practicum in School Administration	3
ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4
ED 873 Pupil Personnel Administration	3
<b>Electives</b>	<b>4</b>
<b>Total</b>	<b>70-71</b>

### **Educational Leadership Program: Educational Administrative Specialist with Pupil Personnel Certification Major No. 281**

<b>Introductory Course Work</b>	<b>11</b>
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<b>Administrative Strand: Focus on Administrative Behavior</b>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<b>Curriculum Strand: Focus on Program Development</b>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<b>Instruction Strand: Focus on Instructional Leadership</b>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Administrative Courses</b>	<b>15</b>
ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>2-3</b>
<b>Total</b>	<b>49-50</b>

### ***Post-Master's Requirements (Certification)***

<b>Concentration Courses</b>	<b>20</b>
ED 873 Pupil Personnel Administration	3
ED 890 Practicum in School Administration	3
ED 874 School Business Management and Facilities	3
ED 971 Superintendent/Staff/Board Relationships	3
CNL 765 Pupil Personnel Services in the School and Community Resources	4
RHB 701 Counseling Theory and Practice	4
<b>Total</b>	<b>69-70</b>

### **Educational Leadership Program: Educational Administrative Specialist with Educational Research Certification Major No. 282**

<b>Introductory Course Work</b>	<b>11</b>
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<b>Administrative Strand: Focus on Administrative Behavior</b>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<b>Curriculum Strand: Focus on Program Development</b>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<b>Instruction Strand: Focus on Instructional Leadership</b>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Administrative Courses</b>	<b>15</b>
ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>2-3</b>
<b>Total</b>	<b>49-50</b>



**Post-Master's Requirements (Certification)**

Concentration Courses	17-25
ED 752 Statistical Analysis and Research Design	4
ED 753 Advanced Educational Statistics	4
ED 757 Student Appraisal Methods	4
ED 755 Research Projects or ED 899 Thesis	5-9
Electives	0-4
<b>Total</b>	<b>70-75</b>

**Educational Leadership Program:  
Educational Administrative Specialist with  
Special Education Certification  
Major No. 283**

Introductory Course Work	11
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
Common Educational Leadership Courses	21

**Administrative Strand: Focus on Administrative  
Behavior**

ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3

**Curriculum Strand: Focus on Program Development**

ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3

**Instruction Strand: Focus on Instructional Leadership**

ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3

**Administrative Courses**

ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3

Electives	2-3
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<b>Total</b>	<b>49-50</b>
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**Post-Master's Requirements (Certification)**

Concentration Courses	23
CNL 765 Pupil Personnel Services in the School and Community Resources	4
ED 890 Practicum in School Administration	3
CNL 661 Principles of Counseling	4

CNL 857 Practicum in School Psychology	4
ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4

<b>Total</b>	<b>72-73</b>
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**Educational Leadership Program:  
Educational Administrative Specialist with  
School Community Relations Certification  
Major No. 284**

Introductory Course Work	11
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
Common Educational Leadership Courses	21

**Administrative Strand: Focus on Administrative  
Behavior**

ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3

**Curriculum Strand: Focus on Program Development**

ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3

**Instruction Strand: Focus on Instructional Leadership**

ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3

**Administrative Courses**

ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3

Electives	2-3
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<b>Total</b>	<b>49-50</b>
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**Post-Master's Requirements (Certification)**

Concentration Courses	18
ED 785 Introduction to Community Education	3
ED 786 Community School	3
ED 787 School and Community	3
ED 890 Practicum in School Administration	3
ED 971 Superintendent/Staff/Board Relationships	3
Electives	3
<b>Total</b>	<b>70-71</b>



**Educational Leadership Program:  
Educational Administrative Specialist with  
Staff Personnel Certification  
Major No. 285**

Introductory Course Work	11
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<i>Administrative Strand: Focus on Administrative Behavior</i>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<i>Curriculum Strand: Focus on Program Development</i>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<i>Instruction Strand: Focus on Instructional Leadership</i>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Administrative Courses</b>	<b>15</b>
ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>2-3</b>
<b>Total</b>	<b>49-50</b>

**Post-Master's Requirements (Certification)**

Concentration Courses	16
ED 872 Staff Personnel Administration	3
ED 890 Practicum in School Administration	3
ED 792 Models of Supervision and Staff Development	4
ED 874 School Business Management and Facilities	3
ED 971 Superintendent/Staff/Board Relationships	3
<b>Electives</b>	<b>4</b>
<b>Total</b>	<b>69-70</b>

**Educational Leadership Program:  
Educational Administrative Specialist with  
Business Management Certification  
Major No. 286**

Introductory Course Work	11
May be taken in any sequence	
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<i>Administrative Strand: Focus on Administrative Behavior</i>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<i>Curriculum Strand: Focus on Program Development</i>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<i>Instruction Strand: Focus on Instructional Leadership</i>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Administrative Courses</b>	<b>17</b>
ED 873 Pupil Personnel Administration	3
ED 890 Practicum in School Administration	3
ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4
ED 873 Pupil Personnel Administration	3
<b>Electives</b>	<b>4</b>
<b>Total</b>	<b>53</b>

**Post-Master's Requirements (Certification)**

Concentration Courses	18
ED 874 School Business Management and Facilities	3
ED 890 Practicum in School Administration	3
ED 871 Management of the School	3
ED 872 Staff Personnel Administration	3
Cognates in Business	6
<b>Electives</b>	<b>3</b>
<b>Total</b>	<b>74</b>



### Educational Leadership Program Teacher Leader Concentration Major No. 291

Introductory Course Work	12
May be taken in any sequence	
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 754 Applied Research and Statistics	4
<b>Concentration Courses</b>	<b>32</b>
ED 734 Analysis of Teaching	4
ED 741 Instructional Design	4
ED 759 Research on Teaching	4
ED 761 Applied Curriculum Theory	4
ED 762 Foundations of Teaching Models	4
ED 763 Instructional Management and Evaluation	4
ED 784 Legal and Professional Issues	4
ED 670 Curriculum and Instruction Workshop	4
<b>Electives</b>	<b>5</b>
<b>Total</b>	<b>48</b>

### Educational Leadership Program Assistant Superintendent Certification Major No. 293

Introductory Course Work	11
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5
<b>Common Educational Leadership Courses</b>	<b>21</b>
<i>Administrative Strand: Focus on Administrative Behavior</i>	
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
<i>Curriculum Strand: Focus on Program Development</i>	
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
<i>Instruction Strand: Focus in Instructional Leadership</i>	
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Educational Administration Concentration</b>	<b>15</b>
ED 780 Public Relations and Politics in Education	3
ED 781 School Finance and Economics	3
ED 782 School Law	3

ED 793 Computer Application for Education Leaders	3
ED 790 Practicum in Instructional Leadership	3
<b>Electives</b>	<b>2-3</b>
<b>Total (M.Ed.)</b>	<b>49-50</b>

### Post-Master's Requirements (Certification)

<b>Concentration Courses</b>	<b>21</b>
ED 871 Management of the School	3
ED 872 Staff Personnel Administration	3
ED 873 Pupil Personnel Administration	3
ED 874 School Business Management and Facilities	3
ED 890 Practicum in School Administration	3
Cognates (Economics, Political Science, Finance, Communication)	3
ED 971 Superintendent/Staff/Board Relationships	3
<b>Total (Principal Certificate; EAS Certificate)</b>	<b>70-71</b>

### Human Services (Counseling) Programs

The human services programs share a common curriculum of courses associated with six different counseling concentrations. Students may choose to obtain an M.A. or M.S. degree in counseling with a specialization in mental health counseling, business and industrial counseling management, or gerontology; marriage and family counseling, student personnel services in higher education, or counseling exceptional children; or students may choose to obtain an M.R.C. degree with a specialization in counseling of the severely disabled or the chemically dependent.

Students entering the human services division must complete both the admission procedures and the appropriate graduate core requirements for their area of concentration. Students plan their program of study in consultation with their adviser and elective courses may be chosen as appropriate.

### Business and Industrial Counseling Management Major No. 265

<b>Introductory Course Work</b>	<b>13</b>
RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>43</b>
CNL 667 Group Background and Theory	4
CNL 762 Career Development and Information Services	4
CNL 860 Advanced Seminar in Counseling	3



CNL 864 Practicum I: Individual	4
CNL 971 Counseling for the Life-Span Development	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 973 Social and Cultural Foundations in Counseling	4
MGT 621 Graduate Survey in Management	3
MGT 700 Organizational Behavior and Theory	3
MGT 703 Seminar in Personnel Administration	3
MGT 705 Seminar in Industrial Relations	3
RHB 705 Behavioral Assessment	4

**Recommended Electives**

CNL 663 Mental Health I	4
CNL 767 Group Processes in Counseling and Guidance	3
CNL 770 Independent Study	1-3
CNL 779 Marriage and Family Counseling	4
COM 643 Interviewing	4
COM 645 Conference Leadership	4
COM 647 Organizational Communication	4
COM 651 Communication Consulting and Training	4
MGT 706 Organizational Development and Change	3
RHB 730 Epidemiology of Chemical Dependency	4
<b>Total</b>	<b>60</b>

**Gerontology  
Major No. 266**

<b>Introductory Course Work</b>	<b>13</b>
RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5

**Professional Requirements** 43

CNL 667 Group Background and Theory	4
CNL 860 Advanced Seminar in Counseling	3
CNL 865 Individual Practicum	4
CNL 866 Advanced Individual and Group Practicum	4
CNL 971 Counseling for the Life-Span Development	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 973 Social and Cultural Foundations in Counseling	4
RHB 702 Medical Assessment/Gerontology	4
RHB 705 Behavioral Assessment	4
SW 662 Social Gerontology	4

**Recommended Electives** 8

AT 743 Art with the Older Adult	1-3
CNL 670 Counseling Workshop	3
CNL 762 Career Development and Information Services	4

CNL 779 Marriage and Family Counseling	4
ED 651 Nature and Needs of the Multiply Handicapped	3
MGT 621 Graduate Survey in Management	3
MGT 703 Seminar in Personnel Administration	3
PSY 647 Psychology of Aging	4
SW 663 Social Gerontology II	4
<b>Total</b>	<b>60</b>

**Mental Health Counseling  
Major No. 267**

<b>Introductory Course Work</b>	<b>13</b>
RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5

**Professional Requirements** 46-47

CNL 663 Mental Health I	4
CNL 667 Group Background and Theory or CNL 767 Group Process in Counseling and Guidance	3-4
CNL 762 Career Development and Information Services	4
CNL 773 Mental Health II	4
CNL 779 Marriage and Family Counseling	4
CNL 860 Advanced Seminar in Counseling	3
CNL 865 Individual Practicum	4
CNL 866 Advanced Individual and Group Practicum	4
CNL 971 Counseling for the Life-Span Development	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 973 Social and Cultural Foundations in Counseling	4
RHB 705 Behavioral Assessment	4

**Recommended Electives**

Although professional requirements encompass the total sixty hours, courses in areas to increase one's level of expertise are recommended.	
CNL 664 Crisis Intervention Counseling	4
CNL 670 Counseling Workshop: Human Sexuality I and II	6
CNL 670 Counseling Workshop: Counseling Older Adults	3
CNL 767 Group Processes in Counseling and Guidance	3
CNL 769 Techniques of Child Counseling	4
CNL 778 Techniques of Play Therapy	4
RHB 730 Epidemiology of Chemical Dependency	4
RHB 731 Treatment Approaches in Chemical Dependency	4

**Total** 60

Note: CACREP accreditation may increase required hours of Major No. 267 to 75 in the fall of 1988. Contact the divisional director for information.



## Marriage and Family Counseling Major No. 268

### Introductory Course Work 13

RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5

### Professional Requirements 55

SOC 560 Sociology of the Family	4
CNL 779 Marriage and Family Counseling	4
CNL 780 Systems Theory and Family Counseling	4
CNL 781 Advanced Techniques of Family Counseling	4
CNL 782 Techniques of Marital Counseling	4
CNL 670 Counseling Workshop: Human Sexuality and Counseling	3
CNL 663 Mental Health I	4
CNL 971 Counseling for the Life-Span Development	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 973 Social and Cultural Foundations in Counseling	4
CNL 867 Internship: Marriage and Family Counseling	12
RHB 705 Behavioral Assessment	4

### Recommended Electives 4

Choose one of the following	
RHB 730 Epidemiology of Chemical Dependency	4
CNL 664 Crisis Intervention Counseling	4
CNL 667 Group Background and Theory	4
CNL 769 Techniques of Child Counseling	4
CNL 778 Techniques of Play Therapy	4
CNL 773 Mental Health II	4
SOC 540 Social Organization	4
SOC 670 The Future of the Family	4

### Total 72

## Rehabilitation Counseling: Chemical Dependency Major No. 270

### Introductory Course Work 13

RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5

### Professional Requirements 49-50

CNL 663 Mental Health I	4
CNL 779 Marriage and Family Counseling	4
CNL 667 Group Background and Theory or CNL 767 Group Processes in Counseling and Guidance	3-4
CNL 973 Social and Cultural Foundations in Counseling	4

RHB 702 Medical Assessment	2
RHB 705 Behavioral Assessment	4
RHB 730 Epidemiology of Chemical Dependency	4
RHB 731 Treatment Approaches in Chemical Dependency	4
RHB 801 Internship: Severe Disability and RHB 802 Internship II	20

### Recommended Electives

CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 971 Counseling for the Life-Span Development	4

### Total 62-63

## Rehabilitation Counseling: Severely Disabled Major No. 271

### Introductory Course Work 13

RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5

### Professional Requirements 48-49

CNL 667 Group Background and Theory or CNL 767 Group Processes in Counseling and Guidance	3
CNL 762 Career Development and Information Services	4
CNL 971 Counseling for the Life-Span Development	4
RHB 700 Counseling: Severe Disability Foundations of Vocational Rehabilitation	4
RHB 702 Medical Assessment	4
RHB 704 Psychological Adjustment: Severe Disability	4
RHB 705 Behavioral Assessment	4
RHB 711 Vocational Evaluation and Job Placement Techniques	4
RHB 720 Counseling: Severe Disability Case Management of Vocational Rehabilitation	3
RHB 775 Graduate Seminar	1
RHB 801 Internship: Severe Disability	10

### Electives 4

Students' choice

### Total 62-63

## Student Personnel Services in Higher Education Major No 274

### Introductory Course Work 13

RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5



<b>Professional Requirements</b>	<b>49</b>
ABS 751 Organizational Training Development	4
CNL 663 Mental Health I	4
CNL 664 Crisis Intervention Counseling	4
CNL 667 Group Background and Theory or CNL 767 Group Processes in Counseling and Guidance	4
CNL 762 Career Development and Information Services	3
CNL 779 Marriage and Family Counseling	4
CNL 860 Advanced Seminar in Counseling	4
CNL 865 Individual Practicum	3
CNL 866 Advanced Individual and Group Practicum	4
CNL 971 Counseling for the Life-Span Development	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
CNL 973 Social and Cultural Foundations in Counseling	4
ED 869 Student Personnel Administration in Higher Education	4
<b>Total</b>	<b>63-64</b>

### Counseling Exceptional Children Major No. 278

<b>Introductory Course Work</b>	<b>13</b>
RHB 701 Counseling Theory and Practice	4
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5
<b>Professional Requirements</b>	<b>19-20</b>
CNL 662 Problems in Student Personality and Development or CNL 663 Mental Health I	4
CNL 667 Group Background and Theory or CNL 767 Group Processes in Counseling and Guidance	3-4
CNL 769 Techniques of Child Counseling or CNL 778 Techniques of Play Therapy	4
CNL 860 Advanced Seminar in Counseling	4
CNL 865 Individual Practicum (with exceptional children)	4
<b>Professional Requirements (Special Education)</b>	<b>9-12</b>
CNL 960 Advanced Institute for Human Services Personnel: Counseling the Gifted	3
ED 641 Mental Retardation and Developmental Disabilities or ED 652 Education of Individuals with Physical, Sensory, and Motor Disorders	3
ED 659 Communication and Consultation Skills for Special Educators and/or ED 722 Gifted Children and Youth	3

<b>Recommended electives</b>	<b>15-19</b>
CNL 779 Marriage and Family Counseling	4
CNL 973 Social and Cultural Foundations of Counseling	4
ED 603 Child Development	3
ED 604 Adolescent Development	3
ED 645 Career Education and Occupational Training for Exceptional Individuals	3
ED 655 Nature and Needs of the Mildly Handicapped	2
ED 720 Creative Problem Solving in Classrooms	3
ED 723 Teaching the Gifted	3
ED 740 Education of Children with Severe Emotional Problems	3
RHB 705 Behavioral Assessment	4
<b>Total</b>	<b>60</b>

### Student Personnel Services Program

The student personnel services program, leading to the Master of Arts or Master of Education degree, offers concentrations in school counseling or school social worker. This program is designed for students with professional backgrounds in education.

Students are expected to take electives in areas other than counseling and guidance. Elective courses are mutually decided upon by the student and the adviser. Graduate courses in the behavioral sciences (anthropology, psychology, sociology) are suggested electives. Depending upon the student's background and educational objectives, other electives may be more appropriate.

Students entering the program of counselor preparation must complete both the admission procedures and the appropriate graduate core requirements for their area of concentration and complete an exit evaluation.

The following requirements and procedures must be met by students applying for the M.Ed. or M.A. degrees within student personnel services: complete appropriate graduate core requirements for area of concentration; complete an interview with the assigned adviser and file a planned program of study; demonstrate proficiency with specified counseling behaviors during CNL 863; and complete the application for a counseling practicum during the first week of the term preceding the quarter in which the practicum is offered, except for fall quarter for which application is made during the first two weeks of spring quarter.

New state certification requirements were adopted January 1, 1986. Students should contact the director of the Division of Human Services for information.



**School Counseling****Major No. 275**

<b>Introductory Course Work</b>	<b>13</b>
CNL 863 Techniques of Counseling	4
ED 751 Educational Statistics and Research	5
RHB 701 Counseling Theory and Practice	4
<b>Professional Requirements</b>	<b>45-46</b>
CNL 662 Problems in Student Personality and Development	4
CNL 762 Career Development and Information Services	4
CNL 767 Group Processes in Counseling and Guidance or CNL 667 Group Background and Theory	3
CNL 765 Pupil Personnel Services in the School and Community Resources	4
RHB 705 Behavioral Assessment	4
ED 655 Nature and Needs of the Mildly Handicapped	4
CNL 779 Marriage and Family Counseling	4
CNL 973 Social and Cultural Foundations in Counseling	4
ED 773 Curriculum Theory and Practice	3
CNL 865 Individual Practicum	4
CNL 866 Advanced Individual and Group Practicum	4
CNL 860 Advanced Seminar in Counseling	3
<b>Total</b>	<b>58-59</b>

*Note:* CACREP accreditation may increase the required hours of Major No. 275 to 72-75 in the fall of 1988. Contact the divisional director for information.

**School Social Worker****Major No. 277**

<b>Introductory Course Work</b>	<b>13</b>
RHB 701 Counseling Theory and Practice	4
ED 751 Educational Statistics and Research	5
CNL 863 Techniques of Counseling	4
<b>Professional Requirements</b>	<b>54</b>
CNL 662 Problems in Student Personality and Development	4
ED 701 Advanced Educational Psychology	3
RHB 705 Behavioral Assessment	4
CNL 765 Pupil Personnel Services in the School and Community Resources	4
CNL 779 Marriage and Family Counseling	4
CNL 972 Legal, Professional, and Ethical Issues in the Human Services	4
ED 787 School and Community	3
SOC 532 Juvenile Delinquency	4
CNL 773 Mental Health II	4
CNL 865 Individual Practicum	4
CNL 866 Advanced Individual and Group Practicum	4

CNL 664 Crisis Intervention Counseling	4
PSY 633 Exceptional Child	4
CNL 667 Group Background and Theory	4

**Electives** **1**

Electives are coordinated with the candidate's individualized background of experience and training. Please see adviser for elective approval.

**Total** **68**

*Note:* Students may elect to complete a thesis. This involves 9 hours of thesis credit and ED 752. Total hours remain the same.

**Master of Art Therapy****Major No. 249**

The Master of Art Therapy program prepares professionals to work with people in treatment, education, rehabilitation, nonverbal expression, and communication. Training and course work in art therapy are important for students preparing to become art therapists, for art teachers desiring specialized courses, and for people in the human services professions.

Art therapists work with people of all ages with various degrees and kinds of disabilities and handicapping conditions, with individuals, groups and families, and in a multitude of settings such as mental health centers, psychiatric and general hospitals, educational and rehabilitative settings, nursing homes and residential treatment centers, and others.

Admission to the program is based on the applicant's previous academic work (with any prerequisites identified at the beginning of the program), letters of reference, and work in art media. A personal interview is scheduled during the first quarter of work at which time a portfolio of work is shown. Students admitted to the M.A.T. program may choose full-time or part-time courses of study. With the required clinical internship, the normal course of study may be completed in approximately two years.

**Professional Course Sequence**

<b>Introductory Course Work</b>	<b>12</b>
May be taken in any sequence	
AT 730 Art Therapy	3
ED 751 Educational Statistics and Research	5
RHB 701 Counseling Theory and Practice	4
<b>Art Therapy Foundations I</b>	<b>12</b>
AT 735 Art Therapy I: Theories and Methods	3
AT 736 Art Therapy II: Theories and Methods	3
AT 738 Art Therapy III: Theories and Methods	3
AT 739 Art Therapy IV: Theories and Methods	3



<b>Art Therapy Foundations II</b>	<b>13</b>
AT 644 Art and the Special Student	3
AT 648 Art for the Disabled and Handicapped Person	3
AT 723 Art Media in the Special Setting	3
AT 743 Art with the Older Adult	3
AT 753 Research in Art Therapy	1

<b>Art Therapy Clinic/Seminar</b>	<b>11</b>
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AT 771 Art Therapy Clinic I	1
AT 772 Art Therapy Clinic II	9
AT 774 Seminar in Art Therapy	1

<b>Art Therapy Program Exit Options</b>	<b>5-9</b>
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*Selected from the following:*

AT 766 Project in Art Therapy	5
AT 773 Art Therapy Clinic III	5
AT 899 Thesis	9
Art Therapy Comprehensive Examination	

<b>Advised Electives</b>	<b>3-12</b>
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AT 629 Workshop in Art Therapy	1-6
AT 744 Art with Exceptional Populations	3
AT 770 Independent Study in Art Therapy	1
AED 631 Art and the Child	3
AED 741 Art with the Gifted and Talented Student	3
CNL 663 Mental Health I	4
CNL 778 Techniques of Play Therapy	4
ED 603 Child Development	3
ED 740 Education of Children with Severe Emotional Problems	3
ED 747 Leadership for School Improvement	4
PSY 511 Abnormal Psychology	4
PSY 531 Theory and Research in Personality	4
PSY 639 Theory and Research in Clinical Psychology	4

Note: Additional electives may be added to this list. A minimum of 600 clinical hours is included in the M.A.T.

<b>Total (minimum requirement)</b>	<b>60</b>
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## Library and Communication Science

Technological advancements have redefined the role of library and communication science personnel from collector of resources and management of facilities to that of instructional designer, computer education specialist, instructional technologist, and most importantly, teacher. New concepts and theories related to learning, such as individualized instruction, instructional development, instructional materials production, multicultural education, and new delivery mechanisms via technology have contributed to this change.

The Division of Library and Communication Science reflects this new role with course and program offerings in the areas of school library media programs, instructional technology, and computer education.

## Library Media Concentration

An M.Ed. degree with a concentration in library media is available. The objectives of the library media program are to acquaint students with the social and educational role of the library media center as a service institution in contemporary society; to familiarize students with the field of librarianship as a profession; to establish a foundation for service by developing professional attitudes toward the responsibilities of library media centers; to acquaint students with current trends and issues in the profession; and to qualify personnel to meet certification requirements of school library media specialists in Ohio and other states.

Excellent facilities support the offerings of the Division of Library and Communication Science. These include the Educational Resource Center, the University Library, computer services, a graphic production laboratory, television studios, and access to the resources of the Southwestern Ohio Council for Higher Education.

A Master of Arts degree in educational media is also available for graduate students who do not have an education background.

## Classroom Teacher: Media Major No. 253

The master's degree program with a concentration in educational media can lead to state certification which would allow a professional to work in a public school library/media center in the elementary and/or secondary level. Students who already hold library media certification can develop an in-depth area within the field.

Students with an educational media background have also found employment in the health sciences, religious organizations, business and industry, and training facilities.

<b>Introductory Course Work</b>	<b>13</b>
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To be taken in any sequence during the first twenty-four credit hours of graduate education course work	
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
ED 751 Educational Statistics and Research	5

<b>Professional Requirements</b>	<b>14</b>
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ED 734 Analysis of Teaching	4
ED 791 Curriculum Design and Evaluation	4
LCS 649 Introduction to Instructional Media	3
LCS 779 Seminar in Educational Media	3

<b>Program Concentration</b>	<b>21*</b>
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## Holder of Education Media Certification

The holder of either an elementary, secondary, or special certificate with educational media may complete this concentration by completing twenty-one hours of LCS electives selected by the adviser and student.



**Validation of Ohio Teaching Certificate**

The holder of a standard elementary teacher's certificate may have that certificate validated for educational media in the elementary school by completing the following courses: LCS 611, Reference Materials and Bibliography; LCS 621, Cataloging and Classification; LCS 635, Production of Instructional Materials; LCS 649, Introduction to Instructional Media (included in professional requirements); LCS 661, Selection of Materials; LCS 691, Organization and Administration of School Media Centers; ED 721, Literature for Elementary Children; LCS 780, Internship; and additional courses to complete thirty hours of LCS course work.

The holder of a standard secondary teacher's certificate may have educational media added to that certification by completing the following courses: LCS 611, Reference Materials and Bibliography; LCS 621, Cataloging and Classification; LCS 635, Production of Instructional Materials; LCS 649, Introduction to Instructional Media (included in professional requirements); LCS 661, Selection of Materials; LCS 663, Literature for Adolescents and Young Adults; LCS 691, Organization and Administration of School Media Centers; ED 721, Literature for Elementary Children; and LCS 780, Internship.

The holder of an elementary or secondary teacher's certificate may obtain a special (K-12) teacher's certificate by completing the teaching field requirements of forty-five hours of course work in LCS including the following: LCS 611, Reference Materials and Bibliography; LCS 621, Cataloging and Classification; LCS 635, Production of Instructional Materials; LCS 649, Introduction to Instructional Media; LCS 661, Selection of Materials; LCS 663, Literature for Adolescents and Young Adults; LCS 691, Organization and Administration of School Media Centers; ED 721, Literature for Elementary Children; LCS 780, Internship; and additional courses to complete forty-five credit hours of LCS course work.

<b>Total</b>	<b>48*</b>
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\*Additional courses required for validation.

**Supervisor/Media  
Major No. 289**

This concentration is primarily for students who desire a curriculum and/or supervision position in media. They must have twenty-seven months of teaching experience under a standard certificate in the field (educational media) for which the supervisor's certificate is sought.

<b>Introductory Course Work</b>	<b>11</b>
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or 703 Philosophy of Education	3
ED 751 Educational Statistics and Research	5

<b>Professional Requirements</b>	<b>21</b>
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 777 Prepracticum: Role and Function of Educational Leaders	3
<b>Supervision Concentration</b>	<b>17</b>
ED 791 Curriculum Design and Evaluation	4
ED 792 Models of Supervision and Staff Development	4
ED 793 Computer Application for Educational Leaders	3
ED 790 Practicum in Instructional Leadership	3
LCS 795 Administration and Supervision of the Audiovisual Program	3
<b>Total</b>	<b>49</b>

**Computers in Education  
Concentrations****Classroom Teacher: Computer Education  
Major No. 244**

The intent of the Classroom Teacher: Computer Education program of study is to prepare teachers to make more effective use of computers in the classroom. The program covers computer-assisted instruction, selecting and evaluating appropriate computer software, developing lessons incorporating courseware, and using computer tools and utilities to make the job of teaching more efficient. It is *not* the intent of this program to prepare a teacher to teach any of the programming languages such as BASIC or PASCAL.

<b>Introductory Course Work</b>	<b>13</b>
ED 751 Educational Statistics and Research	5
ED 704 Introduction to Foundations of Education	4
ED 747 Leadership for School Improvement	4
<b>Professional Requirements</b>	<b>11</b>
ED 734 Analysis of Teaching	4
ED 791 Curriculum Design and Evaluation	4
LCS 749 Developing Materials for Instruction	3
<b>Program Requirements</b>	<b>23</b>
LCS 685 Computers for Educators	3
LCS 686 Applications of Computers in Education	3
LCS 687 Introduction to BASIC for Educators	4
LCS 781 LOGO and Problem Solving	3



LCS 782 Designing Educational Software	3
LCS 780 Internship	4
ED 810 Seminar in Elementary Education or ED 820 Seminar in Secondary Education	3
<b>Electives</b>	<b>1-3</b>

**Total** **48-50**

*Note:* In addition, students will need to demonstrate functional knowledge of BASIC and one of the following languages: PASCAL, COBOL, or FORTRAN.

### **Curriculum and Supervision: Computer Facilitator Major No. 292**

The intent of the Curriculum and Supervision: Computer Facilitator program of study is to prepare teachers to work with teachers, administrators, vendors, and computer scientists as related to computer use in schools. Supervisory skills, curriculum development, and general knowledge of computers and computers in education are covered. It is *not* the intent of this program to prepare a teacher to teach any of the programming languages such as BASIC or PASCAL.

<b>Introductory Course Work</b>	<b>11</b>
ED 751 Educational Statistics and Research	5
ED 701 Advanced Educational Psychology	3
ED 702 Social Foundations of Education or ED 703 Philosophy of Education	3
<b>Professional Requirements</b>	<b>21</b>
ED 771 Educational Leadership Behavior	3
ED 772 Educational Administrative Behavior	3
ED 773 Curriculum Theory and Practice	3
ED 774 Curriculum Organization	3
ED 775 Leadership for Instructional Improvement	3
ED 776 Supervision of Instruction and Personnel	3
ED 790 Practicum in Instructional Leadership	3
<b>Program Requirements</b>	<b>16</b>
LCS 685 Computers for Educators	
LCS 686 Applications of Computers in Education	3
LCS 687 Introduction to BASIC for Educators	4
LCS 781 LOGO and Problem Solving	3
LCS 782 Designing Educational Software	3
<b>Total</b>	<b>48</b>

*Note:* In addition, students will need to demonstrate functional knowledge of BASIC and one of the following languages: PASCAL, COBOL, or FORTRAN.

## **Elementary Education**

See Education and Human Services

## **Engineering**

See Systems Engineering

## **English Language and Literatures**

The Department of English Language and Literatures offers a flexible M.A. program designed to meet various needs, including those of prospective or practicing high school or junior college English teachers and those of predoctoral students. The program is structured around work in language, literature, and writing. Courses are regularly available in the standard areas of English and American literature, linguistics, and in nontraditional and interdisciplinary studies. Options allow students to design programs to meet their educational goals. In addition to the course and thesis options, an interdisciplinary option permits work in communications, reading, religion studies, or history. Internships prepare students for junior college positions by providing teaching experience at a two-year college or for positions in special collections and archives and private and rare book libraries by offering on-the-job experience at appropriate institutions. Other course options include creative writing; professional, business, and technical writing; TESOL, which includes linguistics; and women's studies. Full-time or part-time study is possible.

### **The Graduate Faculty**

#### **Professors**

William D. Baker (Emeritus), American literature, creative writing  
Peter S. Bracher (chair), Victorian literature, English novel

Eugene B. Cantelupe (Emeritus), Renaissance literature, iconography

Norman R. Cary, literary criticism, American literature

O. Elizabeth Harden, English romantic literature, English novel

Lillie P. Howard, black American literature, eighteenth-century novel, Jane Austen

James M. Hughes, American literature, American studies, popular culture

Lawrence E. Hussman, American literature, naturalism

Martin Maner, eighteenth-century English literature

Gary B. Pacernick, creative writing, modern poetry

Mary Beth Pringle, modern novel; women's literary studies; professional, business, and technical writing



## 92 Programs/English Language and Literatures

Martha C. Sammons, technical writing

Donald R. Swanson, nineteenth- and twentieth-century English literature, English novel

Thomas R. Whissen, modern British literature, comparative literature, English novel

### *Associate Professors*

Richard H. Bullock, director of writing programs

Cecile W. Cary, Shakespeare, Renaissance studies

Robert M. Correale, Chaucer, Middle English literature

James J. Gleason, American literature, twentieth-century British literature

Henry S. Limouze, Milton, seventeenth-century literature, linguistics

### *Assistant Professor*

Marguerite G. MacDonald, director of TESOL/ESL

## Admission

### Regular

In addition to meeting the admission requirements of the School of Graduate Studies, applicants for regular standing in the M.A. program in English must present an undergraduate major in English from an accredited college or university or the equivalent (thirty semester hours or forty-five quarter hours in English beyond freshman English reasonably distributed between lower- and upper-division courses); a minimum grade point average of 3.0 (on a 4.0 scale) in their undergraduate English courses; and an overall undergraduate grade point average of 2.7 or better (on a 4.0 scale). Applicants with deficiencies in their undergraduate preparation may be admitted to regular status but required to take additional courses.

### Conditional

Applicants whose overall grade point average is between 2.7 and 2.5 will be admitted to conditional standing by action of the English department graduate committee if they meet the first and second requirements above. To attain regular standing, students must be reviewed by the graduate committee, and must earn a grade of B or better in each of the first three graduate courses (twelve credit hours) taken.

Upon petition of the student seeking admission, reasonable exceptions to these requirements may be made for sufficient cause.

### International Students

It is essential that applicants for an M.A. in English be able to demonstrate their proficiency in written and spoken English. In addition to a minimum TOEFL score of 600, applicants should submit (1) a sample of written English in the form of one or two school papers, one that the applicant

regards as his or her best effort and perhaps a second showing a professor's marks and grade; and (2) a score on the Test of Spoken English, which can be taken on the same date as the TOEFL test.

## Nondegree in English

Nondegree students enrolled in English graduate courses are subject to review and approval by the English department graduate committee.

## Advising

No student should take graduate work without departmental advisement. Both full- and part-time students should consult regularly each quarter with the director of graduate studies in English, the department's graduate adviser. Students taking graduate English courses who are not enrolled in the M.A. program should also consult the director of graduate studies to determine the courses that will best meet their needs.

## Graduate Handbook

The department publishes a handbook for graduate students. It provides detailed information on all aspects of the M.A. program. No student should pursue graduate work in English without obtaining a copy from the departmental office.

## Financial Assistance

The Department of English Language and Literatures awards a limited number of graduate assistantships annually to qualified students. Assistantships are usually assigned teaching responsibilities. Assistantships may be renewed for a second year, and assistants can complete the requirements for a degree in two academic years.

International students who wish to apply for teaching assistantships must demonstrate near-native proficiency in English on the Test of Spoken English (see previous section, International Students).

## Degree Requirements

The master's program in English enables students to increase their knowledge of English and American literature and language and to improve their critical skills and their grasp of scholarly method. To meet these goals the program utilizes three groups of courses:

The 600-level courses offer widely varied topics in literature and language and are especially suitable for students wishing to extend their knowledge of English and American literature and linguistics.

The 700-level core courses provide students with the necessary scholarly and critical skills for graduate-level work; all students in the program are required to take both ENG 701 and 702.



The 700-level seminar courses offer opportunities for intensive and specialized scholarly and critical study on a broad range of specific literary and linguistic topics; three seminars are required of all students in the program.

Additional elective courses are available in language and writing.

All students are required to take the M.A. exam.

## Program of Study

### Core Courses 8

ENG 701 Methods and Materials of Research	4
ENG 702 History of Literary Criticism	4

### Additional Courses 20

Five 700-level courses, at least three of which must be seminars: ENG 730, 740, 750, 760, 770 (prerequisite ENG 701)

### Elective Options 20-22

#### Course Option

Five additional courses at the 600 or 700 level 20

#### Interdisciplinary Option

One or two additional courses at the 600 or 700 level 4-8

Four or five graduate courses from outside the department 12-16

#### Communication Option

**Organizational Communication Option 20-22**  
This track is designed to develop or enhance applied communications skills appropriate to work in organizations in the public and private sectors.

#### Required 16

COM 741 Principles and Application of Communication Theory  
COM 643 Interviewing  
COM 647 Organizational Communication  
COM 651 Communication Consulting and Training

#### Elective(s) 4-6

One or two courses chosen by the student from offerings in the department and approved by the departmental adviser.

#### Mass Communication Option 20-22

This track is designed to develop or enhance applied communication skills appropriate to work in the mass media of radio, television, print journalism, cable, and videotape.

#### Required 16

COM 741 Principles and Application of Communication Theory  
COM 654 Feature Story Writing  
COM 658 Editing for the Media  
COM 662 Mass Media Law and Regulation

#### Elective(s) 4-6

One or two courses chosen by the student from offerings in the department and approved by the departmental adviser.

#### Communications Studies Option 20-22

This track is designed to allow students to design a program of study that coherently complements the English curriculum and allows for the development of applied communication skills or the enhancement of theoretical sophistication in the communicative arts.

#### Required 4

COM 741 Principles and Application of Communication Theory

#### Elective(s) 16-18

Courses chosen by the student from offerings in the department and approved by the departmental adviser.

#### Two-Year College Teaching Option

ENG 717 The Study of Writing 4

ENG 795 Internship and Apprenticeship 4-8

Additional courses: recommended are  
ENG 716 The Study of Literature or approved courses in communication or education

#### Thesis Option

Three additional courses at the 600 or 700 level 12

ENG 799 Thesis (total of eight credits required) 8

#### Creative Writing Option

ENG 694 Creative Writing Seminar 4

ENG 799 Thesis (total of eight credits required) 8

Two other courses chosen in consultation with the thesis director (e.g., ENG 694, ENG 710, ENG 712, contemporary literature, literary criticism, aesthetics) 8

#### Archival/Library Option

HST 710, 714 Archival Administration 6

HST 712, 713 Historical Administration 6

HST 711 State and Local History 2

ENG 795 Internship and Apprenticeship 5

MGT 621 Graduate Survey in Management or MKT 720 Service and Nonprofit Organization Marketing 3

One of the following: LCS 621 Cataloging; LCS 635 or 649 Instructional Materials; LCS 740 History of Books and Printing; ACC 621 or ACC 622 Graduate Survey of Accounting 3

#### Professional, Business, and Technical Writing Option

ENG 718 The Study of Professional Writing 4

ENG 795 Internship and Apprenticeship 4-8



## 94 Programs/English Language and Literatures

*Choose one or two from the following additional courses:*

- FIN 621 Graduate Survey in Financial Management  
MGT 621 Graduate Survey in Management  
MKT 621 Graduate Survey in Marketing  
LAW 611 Graduate Survey of Law and the Legal Environment  
PSY 504 Industrial and Organizational Psychology  
COM 643 Interviewing  
COM 629 Urban Communications Theory  
COM 781 Independent Research

4-8

### *Women's Studies Option*

- ENG 720 Women's Studies through Literature 4  
Two additional graduate-level courses in English or other departments focusing on women (e.g., Virginia Woolf; HST 685 History of American Women; GEO 599 Women's Role in Spatial Organization of Society) 8  
Two or three more graduate-level courses as described immediately above or four to eight hours in ENG 799 Thesis 8

### *TESOL (Teaching English as a Second Language) Option\**

- ENG 679 History of the English Language 4  
ENG 680 Theory of ESL 4  
ED 620 TESOL Methods and Materials 4  
ENG 680 Grammatical Structures of English 4  
ENG 680 Sociolinguistics 4  
ED 660 Practicum 2

**Total** **48**

\*The above twenty-two hours constitute a certificate program in TESOL as well as an option in the English M.A. program.

### **Examination**

During the last quarter in the program, a candidate for a degree must pass a written examination. This examination is based on a selective reading list of major works in English and American literature and is intended to complement the program's emphasis on general skills and specialized courses. The examination consists of two parts: a general examination over either English or American literature and a special examination covering a major author of the student's choice. Consult the departmental graduate handbook for further details. The reading list is available in the departmental office.

### **Thesis**

Students who elect the thesis option or the creative writing option are required to enroll for eight quarter hours of credit under ENG 799 and prepare a thesis or, in the case of creative writing students, a work of imaginative literature, under the supervision of an adviser approved by the director of graduate

studies in English. This thesis will be read and approved by the candidate's committee, which will be chaired by the candidate's thesis adviser.

### **Language Requirement**

A reading knowledge of a modern foreign language is not required of any student but is strongly recommended for students contemplating additional graduate work at the doctoral level. An adequate reading knowledge can be demonstrated either by course work or an examination that certifies competence at the third-year level.

## **Finance, Insurance, and Real Estate**

See Business and Administration

## **Financial Administration**

See Business and Administration

## **Geological Sciences**

The Department of Geological Sciences offers two graduate degree programs which are broadly interdisciplinary in scope and flexibility. They are designed to meet the needs of individual students in a contemporary geologic framework. These programs are the Master of Science and Master of Science in Teaching (earth science). Candidates for the Master of Science degree are generally those seeking to assume a place in the professional practice of geology or to continue in graduate study. Candidates for the Master of Science in Teaching degree are primarily those seeking increased proficiency in teaching earth science in secondary schools and junior colleges.

### **The Graduate Faculty**

#### *Professors*

- C. Bryan Gregor, geochemistry, sedimentology  
Byron F. Kulander, structural geology, geophysics  
Paul Pushkar, isotopic geochemistry, igneous and metamorphic petrology, field geology  
Benjamin H. Richard, field geology, exploration geophysics  
Ronald G. Schmidt, hydrogeology, environmental geology, engineering geology



Karel Toman, crystallography, X-ray crystallography, X-ray spectroscopy, geophysical data processing materials science

Raphael Unrug (chair), basin analysis tectonics

#### **Associate Professors**

Kenneth F. Kramer, geochemistry, mineralogy, optical crystallography

Paul J. Wolfe, exploration geophysics

#### **Assistant Professors**

G. Robert Brakenridge, clastic sedimentology, stratigraphy, quaternary geology, fluvial processes

Cindy Carney, carbonate petrology

Galen Kenoyer, hydrogeology

Hugo A. Loaiciga, mathematical geoscientist

## **Facilities and Research**

The Department of Geological Sciences is housed in the Brehm Laboratory with some segments in Oelman Hall and Fawcett Hall. Department facilities include twelve teaching and research laboratories and a wide variety of specialized facilities. Active research programs exist in a wide range of theoretical and applied areas.

In addition to the laboratory facilities described here, the department has an unusual array of field equipment for faculty and student use. This equipment includes three truck-mounted drilling rigs, trucks, vans, and other vehicles for extensive field research. Two technicians are employed to maintain and improve equipment capability of both field and laboratory equipment.

The mineralogy/crystallography/petrology laboratories feature reference and display collections of minerals and rocks, three X-ray diffraction units equipped with powder and single-crystal accessories, an electron microprobe, a Zeiss universal microscope, and several student model microscopes. A Logitech thin-sectioning machine and facilities for mineral separations are available. Current projects involve mineral solid solutions and the characterization of basalts and amphibolites.

The geochemistry laboratory has complete facilities for analysis of geological materials using chromatographic, atomic absorption, and X-ray fluorescence techniques. Current projects deal with the chemistry of polluted ground waters and the isotope geochemistry of brines and reservoir rocks of petroleum fields in the Illinois basin.

The sedimentary petrology laboratory is equipped with an ISI scanning electron microscope (shared with Mechanical Engineering), a Wild stereomicroscope with drawing attachment, Nuclide Cathodoluminescence Luminoscope, Zeiss Universal R Pol petrographic microscopes, Nikon 35mm macrophotography equipment, UV luminescence equipment, a complete darkroom for black-and-

white photography, an air abrasive, and the petrologic equipment listed previously. Current research projects include the study of Blue Ridge turbidites in Tennessee and the Oriscany sandstone in the Appalachian basin, and the Appalachian basin.

Three laboratories serve the needs of environmental geology and hydrogeology. The hydrogeochemistry laboratories have available the instrumentation for geochemical analyses listed previously. The hydrogeology laboratory has a complete line of field equipment for pumping, water sampling, and field analysis of nonconservative chemical parameters, as well as an ion chromatograph, spectrophotometer, and AA spectrophotometer equipment. The environmental laboratory has both typical and special equipment for field and laboratory determination of physical properties and structure of sedimentary materials. Current research includes tracing ground water contaminants, insular water resource planning and management, and chemical water budget analysis of small ecosystems, hydrodynamic dispersion, isotope hydrology, stochastic analysis of subsurface flow environments, depository and site hydrogeologic characterization for the disposal of radioactive waste, and ground water flow and solute transport modeling.

The laboratory of Applied Sedimentology has been recently upgraded and has facilities for close-interval sieve size and large settling tube size analysis. The latter includes a digital output, computer interface, and a dedicated microcomputer for data retrieval, storage, and analysis. A research petrographic microscope with photomicrographic attachments and an automated point-counting device facilitate research using thin sections. The college's scanning electron microscope is also used in faculty and student sedimentology research. An indexed sedimentology reprint file and computer-generated descriptive statistics and graphics package are part of the laboratory's equipment. Current research projects include field and laboratory investigations of recent fluvial sediments and the mineralogy of sands in relation to plate tectonic setting.

The geophysics laboratory has field equipment for seismic, gravity, magnetic, and radar electrical surveys. The seismic equipment consists of two forty-eight channel and one twenty-four channel digital recording systems, a twelve-trace portable refraction system, truck-mounted and portable drill rigs, geophones, and cables. Field equipment for potential field studies consists of three gravimeters and a magnetometer. Resistivity meters and equipotential instruments are used for electrical surveys. A ground-penetrating radar system provides the capability of detailed shallow subsurface surveys. Current research includes gravity, magnetic, and seismic refraction, and



reflection studies relating to the geology of Ohio, Michigan, and West Virginia. Field work in tectonics and structural geology is concentrated in the Appalachian Mountains and includes projects in the Valley and Ridge and the Blue Ridge regions in West Virginia and Tennessee.

A Gould-SEL 33/77 computer is used for seismic data processing. A network of microcomputer work stations can perform seismic modeling and data analysis. A variety of other microcomputers are available for running applications programs and data storage. Several terminals are maintained for direct access to the IBM 3083E centralized equipment on campus.

The department has established summer field research and teaching programs in the Great Smoky Mountains of Tennessee and in the Gravelly Range of southern Montana. These offer opportunities for research in the field in a variety of geological and physiographic settings.

Excellent cooperative academic and research relationships exist with other departments on campus and with surrounding colleges and universities in southwestern Ohio. The department has wide-ranging capabilities and can accommodate through its facilities a very broad range of research ideas.

## Financial Assistance

Teaching, graduate, and research assistantships and fellowships are available for qualified persons in both of the following programs. The assistantships and fellowships involve a commitment to laboratory and classroom teaching, department operations, or geologic research.

## Degree Requirements

### Master of Science in Geology

A candidate for the Master of Science degree must possess a Bachelor of Arts or Bachelor of Science degree from a recognized institution and is expected to have completed an appropriate geology field course. In addition to the requirements of the School of Graduate Studies, the following requirements of the Department of Geological Sciences must be met:

- 1 Completion of forty-five or more graduate credit hours apportioned in the following way: at least nine hours of thesis credit, and at least thirty-six additional hours of graduate credit in an instructional program approved by the candidate's graduate committee including continuing registration, while on campus, for GL 628, topical seminars in the geosciences
- 2 Presentation of three copies of an approved thesis
- 3 Satisfactory performance in a final thesis defense near the end of the degree program

Because the department offers a wide range of specialization, student programs are planned on an individual basis to meet specific needs. Each graduate student is guided by an advisory committee of three faculty members who are responsible for advice concerning the student's academic program including thesis topic. Ultimate responsibility for satisfactorily fulfilling all requirements rests with the student. Current program concentrations in exploration geophysics, hydrogeology, and petroleum geology are available.

### Master of Science in Teaching (Earth Science)

A candidate for the Master of Science in Teaching (earth science) degree must possess a Bachelor of Arts or Bachelor of Science degree from a recognized institution. In addition to the requirements of the School of Graduate Studies, the following requirements of the Department of Geological Sciences must be met:

- 1 Completion of a minimum of forty-five graduate credit hours apportioned in the following way: a maximum of twelve credit hours in the College of Education and Human Services, three to six credit hours of research credit, an approved geology field course, and additional graduate courses approved by the student's graduate committee to fulfill the minimum credit hour requirement
- 2 Presentation of an approved research project report
- 3 Satisfactory performance in a final examination

Because graduate students working toward this degree are expected to have a wide range of backgrounds, programs must be designed on an individual basis. Graduate students are guided by an advisory committee consisting of two geology faculty members and one education faculty member who are responsible for advice concerning the academic program including research project, the number of education courses, and the selection of other courses to fulfill candidacy requirements. (Geology courses carrying graduate credit for nonmajors are acceptable for this program.) Ultimate responsibility for satisfactorily fulfilling all requirements rests with the student.

## Health Care Management

See Business and Administration



# History

The purpose of the Master of Arts program in history is to provide broad but intensive training for students who intend to pursue careers as professional historians, whether in teaching, research, or archival or historical preservation fields, or for those who desire strong historical backgrounds for other vocational or avocational objectives. The program offers opportunities for specialized study and research, but without neglecting the breadth that characterizes historical work at its best. In recognition of the fact that students' interests and goals are varied, the program provides a choice of three plans (see the following details), all of which lead to a Master of Arts degree. This program is approved by the Ohio Board of Regents.

## The Graduate Faculty

### *Professors*

Carl Becker, Ohio, Civil War

Charles R. Berry, Latin American, oral

Jacob H. Dorn, twentieth-century, United States intellectual

Paige E. Mulholland, United States diplomatic, oral

Andrew P. Spiegel, European intellectual, German, British constitutional

### *Associate Professors*

Martin Arbaji, Roman and Byzantine

Patrick B. Nolan, United States, Jacksonian, urban, frontier, archival administration

Judith A. Sealander, United States social and labor, twentieth-century United States, quantitative

Allan Spetter, United States diplomatic

Tsing Yuan (chair), East Asian

### *Assistant Professors*

Barbara Green, Afro-American, American South Civil War, and Reconstruction

Edgar Melton, Russian

F. Richard Swann, nineteenth- and twentieth-century British, Canadian

Harvey M. Wachtell, United States colonial, revolutionary, early national

## Admission

Decisions regarding admission to the graduate program of the Department of History, continuation in the program, and dismissal from it will be made by the department's curriculum committee. The candidate must meet the requirements of the graduate school, hold a bachelor's degree from an accredited institution, and meet a minimum grade point average (3.0 or better in history and 2.7 overall). Each candidate shall also include a

statement of goals to be sought in the program. In special cases a candidate may be admitted on conditional status with a grade point average below 3.0. Conditional status will be granted only after approval by the department's curriculum committee. Conditional status may be granted upon a favorable committee recommendation based upon the candidate's performance on the Graduate Record Examination, letters of recommendation, and, when the curriculum committee deems it necessary, a personal interview by the committee.

The candidate should have a substantial background of undergraduate course work in history, preferably an undergraduate major in the field. An applicant without such background may enter the program but must take deficiency work as prescribed by the curriculum committee.

A graduate student in any college of the university may take up to three graduate history courses without prior approval of the Department of History. Any student desiring more than twelve credit hours of graduate history courses must consult with an adviser in the Department of History.

## Financial Assistance

The Department of History awards a limited number of assistantships annually to qualified students. Assistants are usually assigned to a faculty member to aid in research, class preparation, and for a variety of other services. Assistantships may be renewed for a second year. Ordinarily, an assistant can complete requirements for a degree in two academic years.

## Degree Requirements

The Master of Arts degree can be earned through one of three programs. Plan A is intended primarily for those students who expect to continue graduate work or who need or desire the full range of professional experience, including intensive research and writing. It assures training in research techniques and the preparation of scholarly papers, culminating in the submission of a thesis. Plan B is intended primarily, but not exclusively, for students not expecting to pursue doctoral studies. Plan C is a program designed for graduate students who are primarily interested in a career in historical and archival administration, or in museum employment. It provides students with both theoretical and practical training in these areas.

For the purpose of planning advanced courses and seminars, each student should consult the graduate director regularly. A student receiving two C's will be placed on academic probation and will be required to appear before the curriculum committee to justify his or her continued participation in the graduate program. Upon review of the student's progress, the curriculum committee may dismiss him or her from the graduate program in history.



**Plan A/Program of Study**

Students must meet all requirements of the School of Graduate Studies, show a reading knowledge of a language necessary for thesis research, and successfully complete HST 799.

Two fields of concentration must be selected, one of which must be a United States history field. A concentration will consist of at least sixteen hours of course work in a designated field of study. The possible areas of concentration are the following:

- 1 United States to 1865
- 2 United States since 1865
- 3 Ancient, Medieval, and Early Modern European
- 4 Modern European
- 5 Non-Western

If students have not had HST 300 and 498 or their equivalent, they must take both HST 698 and 700, only one of which will count toward the fulfillment of graduation requirements.

**History Courses numbered 701 to 708** 16

**Electives in History and Related Subjects** 20

At least twelve credit hours must be taken in history. Related subjects must be approved by the curriculum committee.

**History 799 Thesis** 16

Students will be required to demonstrate a reading knowledge of a language if, in the opinion of the thesis adviser, such knowledge will be necessary for thesis research. There is an oral examination at which time students must defend the thesis.

**Total** 52

**Plan B/Program of Study**

Students must meet all requirements of the School of Graduate Studies.

Two fields of concentration must be selected, one of which must be a United States history field. A concentration will consist of at least twenty hours of course work in a designated field of study. The possible areas of concentration are the following:

- 1 United States to 1865
- 2 United States since 1865
- 3 Ancient, Medieval, and Early Modern European
- 4 Modern European
- 5 Non-Western

If students have not had HST 300 and 498 or their equivalent, they must take both HST 698 and 700, only one of which will count toward the fulfillment of graduation requirements. Students who need to complete HST 700 are strongly encouraged to take it early in their graduate study.

**History Courses number 701 to 708** 20

**Electives in History and Related Subjects** 32

At least twenty credit hours must be taken in history. Any course work taken for credit outside of the department must first be approved by the curriculum committee and must be directly related to the student's course of study.

**Written Comprehensive Examination**

The student will be examined on the two fields of concentration. The examination will be given during the seventh week of a quarter designated by student and graduate adviser.

**Total** 52

**Plan C/Program of Study**

Students must fulfill the requirements of the School of Graduate Studies and successfully complete the following curriculum.

If students have not had HST 300 or 498 or their equivalent, they must take both HST 698 and 700, neither of which will count toward the fulfillment of graduate requirements.

**Professional Core** 24

HST 710, 714 Archival Administration	6
HST 712, 713 Historical Administration	6
HST 711 State and Local History	2
HST 715 Historical Management Internship	5
HST 717 Practicum	2
MGT 621 Graduate Survey of Management or MKT 720 Service and Nonprofit Organization Marketing	3

**History Core** 24

Seminars in U.S. history	12
600-level U.S. history courses	12

**Electives** 6-8

To be chosen from the following courses:

HST 716 American Architectural History	
HST 717 Practicum	
LCS 635 Production of Instructional Materials	
LCS 685 Computers for Educators	
LCS 740 History of Books and Printing	
ACC 621, 622 Graduate Survey of Accounting	
ART 610 Studies in American Art	
ART 697 Museology and Gallery Management	

**Evaluation**

Submission of internship reports and projects and oral or written examination covering history and related elective courses

**Total** 54-56



# Humanities

The Master of Humanities is a flexible, interdisciplinary program in the College of Liberal Arts which provides a path in the liberal arts for students who wish to pursue a curriculum based in more than one discipline. Study leads to a Master of Humanities (M.Hum.) degree.

The program serves a broad range of personal and professional needs, especially for those already established in a career who desire a nontraditional degree for professional advancement or for personal intellectual development. High school teachers of humanities who want a content-emphasis degree, persons who seek a career change at mid-career or after early retirement, and persons who seek a second master's degree in a complementary or even a contrasting field may find this program appropriate for them. Graduates of specialized undergraduate programs may welcome the breadth provided by this master's degree. Full-time or part-time study is possible.

Although anchored in the humanities, the program permits selection of some courses from other areas. At the core of the program are one methods seminar and two required seminars that introduce students to the scope and methodologies of the humanities. In cooperation with the program director, students will design the rest of the curriculum to meet their individual academic goals. Thus, the program has both a specific focus on the humanities and wide flexibility within that broad curriculum area of the College of Liberal Arts.

## The Graduate Faculty

Participating faculty are drawn from departments throughout the College of Liberal Arts, including humanities disciplines as well as allied fields of interest.

### Director

Nicholas Piediscalzi, professor of religion

## Admission

Applicants for admission to the Master of Humanities program must present a bachelor's degree from an accredited college or university with a minimum of thirty semester or forty-five quarter hours in liberal arts disciplines and a minimum grade point average of 3.0 (on a 4.0 scale) in their undergraduate work. Students deemed to have deficiencies in their undergraduate work may be asked to take additional courses.

Additionally, all prospective students are asked to submit a 250-word essay describing their professional and academic background as well as goals they wish to pursue in the Master of Humanities program.

Students who do not meet requirements for regular admission may apply to the program on conditional status.

A maximum of three courses, normally not to exceed twelve quarter hours of credit, will be accepted in transfer for work completed at the master's level at other accredited institutions. Such transfer credits are subject to approval by the program committee as well as to the regulations of the School of Graduate Studies.

## Advising

Upon admission to the program, each student is advised by the director of the program. While enrolled in the program (even if attending on a part-time basis), all students must consult at least once each term with the director. In consultation with the director, the student will design a program of study appropriate to his or her goals. This program, which must also be approved by the program committee, will be filed with the office of the School of Graduate Studies. Any changes in a student's program must have the same approvals. At the appropriate time, the director will also appoint a project committee, approved by the program committee, to direct and evaluate the student's project. The project proposal must be approved by the program committee in the sixth week of the quarter prior to registration for the project (HUM 703).

## Financial Assistance

The college awards a limited number of graduate assistantships annually to qualified students. Prospective students may apply to the school of Graduate Studies or the program director.

## Degree Requirements

The program can be completed in four quarters of full-time work. However, it is designed not only for full-time students but also for part-time students; therefore, it incorporates a minimum of prerequisites and sequences and a variety of options. As a result, it is flexible enough to accommodate part-time students who must combine education with the demands of a full-time job.

The Master of Humanities degree can be earned through one of three programs. Plan A is intended primarily for students who desire to write a traditional thesis and thereby gain the full range of professional experience in independent academic research and writing. Plan B is intended primarily for students who desire more guided class work and an introduction to the classical literature in two related fields on a specific topic, theme, period, or problem. Plan C is intended primarily for students who desire to complete a creative work or project and write an essay that explains the humanities context of the work or project.



## 100 Programs/Humanities

<b>Plan A: Thesis</b>	<b>48</b>
ENG 701 or HST 700	4
HUM 701 and 702	10
Humanities courses from at least two departments	18
Related and/or elective courses	8
Project: A traditional master's thesis (HUM 703)	8
<b>Plan B: Essays</b>	<b>54</b>
ENG 701 or HST 700	4
HUM 701 and 702	10
Primary humanities concentration	16
Secondary humanities concentration	12
Related and/or elective courses	4
Project: Essays (HUM 703) a set of comparative review essays, each six to eight pages in length, accompanied by an introduction and conclusion. The writing of these essays will be directed by a project committee composed of two faculty members, one from each of the student's two areas of concentration. In consultation with this committee of two, the student will identify a question or problem as the focus of his or her final program work and will prepare a short list of the essential readings from the two fields. The student will then write a series of related, short critical essays discussing the selected readings in the light of the identified focus. After the essays have been approved by the faculty supervisors, they will be submitted to the director for final approval.	8
<b>Plan C Project</b>	<b>50</b>
ENG 701 or HST 700	4
HUM 701 and 702	10
Humanities courses from at least two departments	16
Related and/or elective courses	12
Creative project with academic essay (HUM 703). A creative work (e.g., a novel, play, collection of poems, painting, exhibition of paintings, or sculpture, textbook, or curriculum) accompanied by an explanatory essay that is theoretical, critical, and bibliographical; that places the project in its historicocultural context; and that demonstrates that the student is critically aware of the definitions and historical and philosophical presuppositions that underlie the project.	8

Before commencing work on a thesis, a set of essays or a creative project, the student must submit a prospectus to be approved by the student's project committee and the program committee. The student and chair of the project committee will meet with the program committee to

discuss the prospectus after it has been approved by the student's project committee.

The thesis, collection of essays, or project is the capstone of each individually tailored program, which requires the student to bring together in an organized fashion the results of particular investigations related to his or her curriculum.

A student who can demonstrate in an interview with the instructors of both ENG 701 and HST 700 that he or she has had adequate previous course work or professional experience in this area can petition the program committee to have the research methods requirement waived.

## Logistics Management

The College of Business and Administration offers two programs of graduate study in the area of logistics management: a Master of Science degree in logistics management, and a concentration in logistics management within the Master of Business Administration degree program.

See Business and Administration.

## Management

See Business and Administration

## Management Science

See Business and Administration

## Marketing

See Business and Administration

## Math Education

See Education and Human Services

## Mathematics and Statistics

The Department of Mathematics and Statistics offers the Master of Science degree. The graduate program is designed to provide a solid foundation for further professional training or careers in teaching, industry, or government. Degree requirements are flexible, allowing considerable latitude in tailoring the course of study to students'



individual preferences. Options are available in mathematics, applied mathematics, and statistics; or programs may combine two or more of these areas. The applied mathematics option is designed not only for persons with undergraduate training in mathematics but also for those with degrees in related disciplines, such as engineering and physics, who want a solid foundation in mathematics. The statistics option is open to persons with bachelor's degrees in a variety of fields besides mathematics or statistics. The prior mathematical training needed for the statistics option has been kept to a minimum to accommodate students with undergraduate majors in fields such as biology, business, or one of the social sciences. The department makes provision for part-time degree candidates by offering all required courses in the late afternoon or evening.

Graduate students are assigned an adviser from the graduate faculty on the basis of their proposed area of study. Early consultation with the adviser is recommended since the adviser works closely with the student in every phase of the program.

## The Graduate Faculty

### *Professors*

- Gerd H. Fricke, complex analysis  
 Krishan K. Gorowara, numerical analysis, computer graphics  
 Tapas Mazumdar, partial differential equations (abstract methods)  
 Terry A. McKee, logic, graph theory  
 Richard S. Millman, differential geometry  
 Won J. Park, probability, reliability  
 Edgar A. Rutter (chair), algebra  
 David Sachs, ordered structures, foundations of geometry  
 Donald J. Schaefer, numerical analysis, computer operating systems  
 Robert Silverman (Emeritus), combinatorics

### *Associate Professors*

- K. T. Arasu, combinatorics  
 William E. Coppage, algebra  
 Joanne M. Dombrowski, analysis  
 Anthony B. Evans, finite geometry, graph theory  
 Harry Khamis, contingency table analysis  
 Raymond E. Lewkowicz, analysis  
 Leone Y. Low, linear models, analysis of variance  
 Marc E. Low, number theory  
 Carl C. Maneri, algebra, finite geometry

Barbara L. Mann, nonparametric statistics, biostatistics

Gerald E. Meike, foundations

Richard Mercer, operator algebras, mathematical physics

David F. Miller, optimization

Manley Perkel, algebra, combinatorics

Makarand V. Ratnaparkhi, mathematical statistics, biostatistics

Larry Turyn, differential equations, multiparameter problems

James T. Vance, Jr., Fourier analysis

### *Assistant Professors*

- Yiming Hong, coding theory  
 Alexander Kaplan, functional analysis  
 Jian-Tong Lin, numerical analysis  
 Dennis Ryan, applied mathematics, biomathematics  
 Munsup Seoh, nonparametric statistics  
 Alphonso L. Smith, analysis  
 Daniel T. Voss, factorial design  
 Derek J. Westwood, functional analysis

## Admission

Applicants for admission are expected to meet the general requirements for admission to graduate study as established by the School of Graduate Studies. All applicants should also have completed a calculus sequence. In addition, applicants must present postcalculus courses in mathematics, as well as related course requirements, appropriate for the intended program of study. The specific undergraduate preparation required for each of the department's three degree options forms part of the description of each option. Applicants with insufficient preparation may be admitted on the condition that they complete certain prerequisite work to be specified by the department at the time of admission.

## Financial Assistance

The department awards a limited number of graduate teaching assistantships annually to qualified applicants. Assistantships may be renewed for a second year; assistants can complete the requirements for a degree in two years. An assistant's duties normally include classroom teaching, which is a meaningful aspect of the education of graduate students in the mathematical sciences.



## Degree Requirements

The Master of Science degree may be earned by satisfying the requirements of one of three programs. The mathematics option is a flexible program emphasizing sound, fundamental, mathematical training. Students may either complete a traditional curriculum in mathematics or develop, with a graduate adviser, a plan of study that is tailored to their individual needs. This option can provide a solid foundation for doctoral study in mathematics or for careers in teaching, industry, or government. The applied mathematics option and the statistics option are more structured programs but still allow students considerable latitude in designing a course of study. These two programs are primarily intended to prepare students for professional employment in business, industry, or government. However, either one can form a solid foundation for doctoral study or for a career in teaching.

All master's degree candidates are required to pass a comprehensive written examination which must be taken at least one quarter before the expected date of graduation.

### Mathematics Option

This program offers sound mathematical training in the traditional areas of mathematics, yet is flexible enough to allow students to pursue interests in related areas of mathematics. Students may select courses in algebra, analysis, combinatorics, and geometry, as well as differential equations, graph theory, numerical analysis, probability, and statistical theory. Individual interests and future goals determine the actual course of study, within the guidelines given below.

Applicants for this program should have completed a minimum of twenty-one credit hours in mathematics beyond calculus. Courses in analysis (advanced calculus), linear algebra, and modern algebra are particularly important. However, courses in other areas of mathematics may also provide the foundation needed for graduate work in mathematics.

In addition to the requirements of the School of Graduate Studies, the following departmental requirements must be met to earn a degree under this option:

- 1 The student must complete a minimum of forty-five credit hours of courses that have prior approval of the department. Departmental approval is normally given by the student's adviser. At least twenty-four of these hours must be in mathematics or statistics courses numbered 701 or above and may not include MTH 792 or STT 786.
- 2 The twenty-four credit hours at the 700 level must include at least one full-year sequence in mathematics.

The writing of a thesis is optional. Students who elect a thesis may count it for not more than ten hours of credit. The thesis must be approved by the student's adviser and must be prepared to conform to the standards established by the School of Graduate Studies. A thesis defense will be required.

### Applied Mathematics Option

The applied mathematics option provides training in mathematical techniques applicable to a wide range of real-world problems. The objectives of this program are two-fold: to develop students' ability to analyze and solve a variety of mathematical problems and to increase students' understanding of specific problems encountered in other fields. To this end, the curriculum includes course sequences in pure and applied mathematics and advanced courses in related areas such as engineering, computer science, or physics. This option is designed not only for those with undergraduate training in mathematics but also for those with degrees in related fields who wish to acquire a solid foundation in applied mathematics.

Applicants for this program should have completed undergraduate courses in multivariable calculus, linear or matrix algebra equivalent to MTH 355, and ordinary differential equations. Students should also have knowledge of a high-level programming language. Courses in complex analysis, partial differential equations, and physics are recommended.

In addition to the requirements of the School of Graduate Studies, the following departmental requirements must be met to earn a degree under this option. Students who have not, prior to admission, completed two quarters or one semester of real variables course work comparable to MTH 431 and 432 are required to take MTH 631 and 632 as program electives. Full-time students normally take two years to complete this program.

#### Advanced Courses

16

Two of the following pairs of courses, at least one chosen from Group I.

##### Group I

**Numerical Analysis:** MTH 716 Numerical Analysis I: Applied Linear Algebra, and MTH 717 Numerical Analysis II: Finite Difference Methods for Partial Differential Equations or  
MTH 718 Numerical Methods III: Finite Element Methods for Partial Differential Equations

**Advanced Analysis:** MTH 730 Principles of Analysis, and MTH 731 Real Analysis I or MTH 777 Applied Analysis I

##### Group II

**Advanced Algebra:** MTH 751 Algebra I, and MTH 752 Algebra II



**Computational Logic and Logic Programming:**

MTH 725 Computational Logic, and CS 774 Logic Programming

**Applied Analysis:** MTH 777 Applied Analysis I, and MTH 778 Applied Analysis II, if MTH 730 and 731 are chosen from Group I.

**Applied Mathematics Courses** 15–17

Three courses from one of the following groups:

**Continuous Applied Mathematics**

MTH 606 Mathematical Modeling

MTH 607 Optimization Techniques

MTH 680 Methods of Applied Mathematics:  
Geometric Methods

MTH 681 Methods of Applied Mathematics:  
Differential Equations

MTH 682 Methods of Applied Mathematics: Integral Methods

**Discrete Applied Mathematics**

MTH 607 Optimization Techniques

MTH 650 Discrete Algebraic Structures

MTH 657 Combinatorics

MTH 658 Applied Graph Theory

**Probability and Stochastic Processes**

STT 628 Queueing Theory

STT 661 Theory of Statistics I

STT 662 Theory of Statistics II

STT 611 Applied Time Series

STT 702 Applied Stochastic Processes

At least one additional course chosen from the following and the courses in advanced and applied mathematics listed above.

MTH 633 Real Variables III

MTH 634 Introduction to Complex Analysis

MTH 732 Real Analysis II

**Electives** 12–14

Additional approved graduate courses, other than MTH 655, including one of the following:

At least eight hours of courses from outside the Department of Mathematics and Statistics

At least two statistics courses.

Two MTH/STT courses, other than MTH 631 and 632, at least one of which must be taken at the 700 level.

**Total** 45**Statistics Option**

The primary objective of the statistics option is to prepare students to function as professional statisticians in business, government, or industry. The core of required courses provides a thorough grounding in the statistical theory and methodology that are needed for the collection and analysis of data. It also ensures that students become proficient

in consulting and in the use of statistical software.

The advanced statistics courses familiarize students with specific theoretical and applied areas of statistics. Ten hours of electives lend flexibility to the program.

Applicants for this option should have completed a calculus sequence that includes multivariate calculus and a course in linear or matrix algebra. Some experience in computer programming and enough background in probability and statistics to begin basic graduate courses in statistics are also required. This normally means one or two prior courses in probability and statistics, depending on content and level.

In addition to the requirements of the School of Graduate Studies, the following departmental requirements must be met to earn a degree under this option. Full-time students normally take two years to complete this program.

**Required Courses**

23

STT 661, 662 Theory of Statistics I and II\*

STT 666, 667 Statistical Methods I and II\*

STT 764 Design of Experiments

STT 791 Statistical Consulting

**Advanced Statistics Courses**

12

Three courses chosen from the following:

STT 702 Applied Stochastic Processes

STT 721 Sampling Design

STT 740 Contingency Table Analysis

STT 744 Applied Multivariate Analysis

STT 761 and 762 Linear Models I and II

STT 767 Applied Regression Analysis

**Electives**

10

Three courses chosen from the following:

STT 601 Nonparametric Methods

STT 611 Applied Time Series

STT 624 Statistical Control Methods for

Quality and Productivity

STT 626 Reliability and Life Data

STT 628 Queueing Theory

STT 696 Topics in Statistics and Probability

MTH 606 Mathematical Modeling

MTH 607 Optimization Techniques

MTH 631–633 Real Variables I–III

CS 670 Systems Simulation

With the prior approval of the statistics adviser, other appropriate courses, including courses from outside the department, may be used as electives. Credit will be allowed for STT 686 or STT 786, Independent Reading in Statistics and Probability, only if approved in advance.

**Total**

45

\*Students who have taken any of STT 661, 662, 666, or 667 or equivalent prior to entering the program will be required to take additional elective hours in lieu of the courses taken.



## Medicine

A catalog may be obtained from the School of Medicine.

## Microbiology and Immunology

See Biological Sciences

## Music

The Master of Music degree in music education is a professionally oriented program, designed to serve teachers in the public schools, as well as those who wish to teach in junior and community colleges or in four-year colleges. Though all courses are pertinent to terminal degree programs, they would be equally valuable for students who plan to study at the doctoral level. A variety of program options allows students to design programs that suit their professional goals and take into account their backgrounds and experience.

### The Graduate Faculty

#### Professor

William J. Steinhart, music theory, composition

#### Associate Professors

Leland D. Bland, music theory, music history and literature

Barbara R. Foster, piano, music history and literature, chamber music

Charles S. Larkowski, musicology, music history and literature

#### Assistant Professor

Gwen L. Brubaker, music education, choral music

### Admission

In addition to meeting the admission requirements of the School of Graduate Studies, applicants for admission to the Master of Music program in music education must present an undergraduate major in music from an accredited college or university with a minimum grade point average of 3.0 (on a 4.0 scale) in undergraduate course work in music. Applicants must take placement examinations in music education and music history, the results of which will be used in planning their programs. Applicants also must take a music theory proficiency examination. This examination must be successfully completed before any graduate music theory courses are taken. Students who wish to study applied music must audition for the appropriate Applied Music Board.

In addition to completing the normal program, students not holding a standard teaching certificate will be required to earn Ohio certification before graduation.

Exceptions may be made for reasonable cause; such exceptions may require action by the Department of Music Graduate Committee.

### Advising

No student will take graduate work in music without departmental advising. Full- and part-time students enrolled in the program must consult with their advisers each quarter. Students who are not candidates for the degree must have departmental permission as outlined for the particular area of study.

Each regularly enrolled student will be assigned an adviser who, together with the director of graduate studies in music, will design a suitable program for the student, to be filed with the School of Graduate Studies no later than midterm of the second quarter of registration. The student will be assigned a committee of three faculty members who will design and evaluate the oral comprehensive examination.

The Department of Music publishes a handbook, *Guidelines for Graduate Students in Music*. It provides detailed information about all aspects of the M.Mus. program. All graduate students in music should obtain a copy from the departmental office.

### Degree Requirements

The Department of Music offers three major options in program planning. All of the program options include these basic requirements:

- 1 All students are required to take MUS 701, Introduction to Graduate Study in Music Education; MUS 702, Introduction to Research in Music Education; MUS 704, Foundations and Principles of Music Education; at least two 700-level courses in music theory; and at least two 700-level courses in music history and literature.
- 2 During the last quarter in the program, a candidate for a degree must pass an oral comprehensive examination covering the areas of music education, music history and literature, and music theory. The examination will particularly undertake to assess the candidate's comprehension of the general area of music education, and to assess skills and knowledge in the area of concentration within that field. The student who elects the thesis option will be prepared to defend the thesis as well. The examination will be designed and evaluated by the candidate's committee.



## Thesis Option

Course work will be distributed in the areas of music education (twenty-one to twenty-seven credit hours), music history and literature, music theory, and performance (twelve to eighteen credit hours), and thesis (maximum of six credit hours) for a minimum total of forty-five credit hours. Students will prepare a thesis under the supervision of a thesis director, approved by the director of graduate studies in music. The thesis will be read and approved by the candidate's committee.

## Recital Option

Course work will be distributed in the areas of music education (twenty-four to thirty credit hours) and music history and literature, music theory, and performance (fifteen to twenty-one credit hours) for a minimum total of forty-five credit hours. If approved by the appropriate Applied Music Board for the recital option, the student will present a full-length public recital. The recital performance will be heard and judged on a pass-fail basis by the appropriate Applied Music Board. For specifications as to length, content, and procedures for the graduate recital, students should consult the departmental Applied Music Policy Statement, Section IX, *Graduate Study in Applied Music*. This policy statement is available in the office of the Department of Music.

In addition, students will present a research paper related to the recital literature. The paper, equivalent in scope to a term paper, will be read and approved by a permanent member of the music history and literature or music theory faculty.

## Master's Project Option

Course work will be distributed in the areas of music education (twenty-four to thirty credit hours) and music history and literature, music theory, and performance (fifteen to twenty-one credit hours) for a minimum total of forty-five credit hours. In addition, students will present a project. Students may revise, refine, and extend a paper written for a course, or may elect to present a new paper. The project paper will be read and approved by the student's project director and a second reader.

*Note:* In any of the options the student may, with the approval of the director of graduate studies in music and the adviser, elect a maximum of two courses outside the Department of Music. The courses may be substituted for music electives if the student can show the courses are in cognate areas that contribute substantially to the preparation of a teacher in the arts.

## Students Not Enrolled in the M.Mus. Program

A graduate student enrolled in another degree program (e.g., Master of Arts, Master of Humanities, or Master of Education) or a nondegree graduate

student may, with the approval of his or her department, elect certain graduate courses in music. The requirements for courses in each area of music are listed below.

## Music Education

All courses in music education require an undergraduate degree in music. Permission of the director of graduate studies in music and permission of the instructor are required.

## Theory of Music, Music History, and Literature

All courses in music theory and music history and literature require a substantial background in music. Permission of the director of graduate studies in music and permission of the instructor are required.

## Performance

MUS 705, Chamber Music, and MUS 715, Ensemble, require an audition and approval of the instructor. Private study in any area of applied music requires a successful audition before the appropriate Applied Music Board.

For further information, consult the departmental Applied Music Policy Statement, Section IX, *Graduate Study in Applied Music*. This policy statement is available in the office of the Department of Music.

## Nursing

The School of Nursing offers a graduate program leading to a Master of Science degree with a major in nursing. The program is designed to prepare nurses for advanced leadership roles in practice, education, and administration, as well as to pursue doctoral study in nursing. The curriculum includes a core component of courses, three functional areas (advanced clinical practice, nursing education, and nursing administration), a thesis or scholarly project requirement, and several electives. Specialization is possible as students can focus on an area of clinical interest and specific age groups or populations. The program accommodates both full-time and part-time students, with most classes offered in the late afternoon and evening. The sequence of course offerings is somewhat flexible, allowing students to complete the program in one to five years.

## The Graduate Faculty

### Professor

Jeanette Lancaster (dean), nursing administration, community mental health nursing, research in health promotion



**Associate Professor**

Kathleen Boyle, nursing education

Janis M. Campbell, curriculum, research, medical-surgical nursing

Donna M. Deane, nursing administration, nursing education

Virginia Nehring, community health nursing practice, nursing education

Susan G. Praeger, parent-newborn nursing, nursing education

**Admission**

The School of Nursing has several admission requirements in addition to the minimum requirements of the School of Graduate Studies. All prospective students must have a baccalaureate degree in nursing from an NLN-accredited college or university with an overall grade point average in undergraduate work of 3.0, or 2.7 with 3.0 or better in the upper half of undergraduate work. Completion of a statistics course and a course in physical health assessment before admission is highly recommended. Students admitted without a statistics course will be required to enroll in one as a prerequisite or corequisite to NUR 707. A statistics course will not count toward the forty-eight credit hour graduation requirement unless it is a second, graduate-level statistics course taken as an elective. Students without documented expertise in physical/health assessment must complete NUR 710 as a prerequisite or corequisite to NUR 712.

Finally, all applicants must present evidence of licensure to practice nursing in Ohio; liability insurance for NUR 712, 713, and 723; health insurance; and current CPR certification.

All students are required to adhere to the policies and procedures set forth in the Wright State University *Graduate Catalog*.

It is recommended that all application materials for fall quarter be submitted by May 15. Applications received after that date are considered on a space-available basis.

**Facilities**

The School of Nursing is housed on the fourth floor of Allyn Hall. Clinical instructional facilities are abundant and varied. Since June 1984, the school has had a collaborative agreement with the Division of Nursing at Miami Valley Hospital to form a Center for Excellence in Nursing Education. This agreement affords opportunities for research, clinical practice, and education for students and faculty. In addition, the school has contracts with over fifty agencies in the area including hospitals, rehabilitation centers, county health departments, nursing homes, school systems, senior citizen centers, and day care

centers which can be used for clinical experiences and/or research. The School of Nursing also owns a Mobile Health Unit which serves as a health assessment and education center.

For research, the University Library and the Fordham Health Sciences Library are available. The University Library provides media production services and facilities. A Television Center affords the opportunity to produce television programs for public or instructional purposes.

These resources are supplemented by a dozen area academic libraries available through the Southwestern Ohio Council for Higher Education, by membership in the Center for Research Libraries, and by excellent interlibrary loan service.

**Degree Requirements**

The program of study includes a core component of courses, three functional areas (advanced clinical practice, nursing education, and nursing administration), a thesis or scholarly project, and several electives.

The core courses focus on philosophy, theories, concepts, and practices of professional nursing. Courses include a progressive program of advanced nursing practice with field work related to clients who have maximum states of health as well as clients who have altered health states.

The three functional tracks—advanced clinical practice, nursing education, and nursing administration—each include three in-depth courses specific to the functional area and a practicum. Practica provide students the opportunity to apply their knowledge and skills in a health care environment of their choice.

Candidates for the master's degree must meet all of the following requirements:

- 1 Completion of forty-eight credit hours
- 2 Completion of the program within five years
- 3 Maintenance of a 3.0 cumulative grade point average with no more than nine hours of C grades applicable to the degree
- 4 Successful defense of a thesis or successful completion of a scholarly project

**Program of Study**

Summary of Requirements	48
Core Courses	26
(Thesis or scholarly project)	
Functional Area	16
(Advanced Clinical Practice/Education/ Administration)	
Electives	6

**Personnel Counseling**

See Education and Human Services



# Physics

The Department of Physics offers two programs of graduate study leading to the Master of Science and to the Master of Science in Teaching degrees. The program leading to the Master of Science degree is a research master's program with a required thesis and prepares graduates for employment in industrial or government laboratories or for further graduate work in physics. The Master of Science in Teaching program is designed to enable high school physics teachers to upgrade their knowledge of physics by providing a thorough treatment of those areas of physics that form the basis of our modern knowledge. The majority of the course work is taken in physics, with additional courses elected in the field of education. The courses are carefully selected by students in consultation with departmental advisers to fit their backgrounds.

In addition to these degree programs, the Selected Graduate Studies format may be used to develop an individual interdisciplinary course of study. It has been used, for example, to provide an electro-optics option through a combination of engineering and physics courses.

## The Graduate Faculty

### *Professors*

Harvey M. Hanson, atmospheric physics

John S. Martin, plasma physics

### *Research Professors*

David C. Look, semiconductor and device physics

Phil W. Yu, semiconductor and device physics

### *Associate Professors*

Merrill L. Andrews (chair), plasma physics, plasma laser media

Gust Bambakidis, theoretical physics, solid state

Joseph W. Hemsky, solid state and materials

A. Edward Jaworowski, semiconductor physics

Thomas W. Listerman, solid state and materials

Paul J. Wolfe, geophysics

David R. Wood, atomic spectroscopy

### *Research Associate Professors*

William M. Theis, semiconductor and device physics

### *Assistant Professor*

Jerry D. Clark, atomic physics

Gary C. Farlow, solid state, ion implantation

Barney E. Taylor, solid state physics

## Facilities and Research

The Department of Physics is involved in four major areas of research: solid state physics and materials, plasma physics and lasers, atomic spectroscopy, and exploration geophysics. There is also a program in radiological physics.

Research interests in the solid state physics/materials science area center around the properties of metals, metal alloys, semiconductors, and thin films. Typical physical properties of interest are Young's modulus, creep, effects of radiation damage on mechanical and electrical properties, and positron annihilation. The work in semiconductor physics concerns the electrical, thermal, and optical properties of semiconductors of group IV, III-V, and II-VI systems. Correlative studies of defects introduced by growth, heat treatment quenching, ion implantation, or irradiation are made using deep-level transient spectroscopy (DLTS), Rutherford backscattering (RBS), channelling and proton-induced X-ray excitation (PIXE), transmission electron microscopy (TEM), and positron annihilation.

The facilities for experimental work include a 2 MeV electron Van de Graaff accelerator, a 120 keV ion implanter, a 400 keV ion Van de Graaff accelerator, a Polaron modular DLTS system, a positron annihilation spectrometer, cryostats, an automatic internal friction data acquisition system, and electronics for monitoring and controlling the electrical and thermal parameters of the samples. Metallographic and tensile testing equipment is also available. Theoretical studies are directed toward understanding the defects in solids and metal hydrogen systems.

The emphasis of the Wright State high temperature plasma physics program is on the development and refinement of plasma diagnostic systems and on plasma containment by the suppression of instabilities. A mirror machine and a long high-field solenoid are available for these studies. Plasma heating methods include electron and ion cyclotron resonance systems and a high-voltage Penning-type source. Some experimental work is aimed at the suppression of plasma instabilities by the application of feedback, dynamic, or parametric suppression. Data processors include a fast S-100 and a PDP-11 system with D/A, A/D converters. These are used for rapid on-line data acquisition, processing, and storage, and for the cybernetic control of experiments. An ion beam diagnostic system has been constructed. Microwave coupling is studied and applied to sources for the mirror system as well as laser media production. In addition, plasmas utilized as gas laser media and for the deposition of semiconductors are being studied. These plasmas are typically generated with microwave sources.

The atomic spectroscopy laboratory includes the equipment necessary to study a range of



experimental research topics, including the analysis of atomic spectra and time resolved absorption spectroscopy. Presently, spectra of ions are being analyzed by means of a two-meter Czerny-Turner vacuum spectrometer, with the option of higher resolution from a Fabry-Perot etalon. The time resolved absorption apparatus is used in evaluating energy flow kinetics in plasmas important to laser applications. Data acquisition ranges from photographic recording to photon counting with computer facilities available for data acquisition and reduction.

Geophysics research is conducted in cooperation with the Department of Geological Sciences. The emphasis is on using seismic reflection, seismic refraction, and gravity to study the earth's structure in southern Ohio and neighboring regions. Much of this work is related to petroleum, water, and coal resources. Equipment for field work includes 48-trace digital seismic systems, a 24-trace Minisoseismic reflection system, three gravimeters, drill rigs, and field vehicles. Special computer systems are used for processing and modeling seismic data.

Atmospheric physics is studied in cooperation with the climatology group of the Department of Geography. Areas of research interest include airborne albedo measurements and atmospheric modeling for global radiation.

The program in radiological physics concerns the application of radiation physics in radiation therapy of cancer patients. The facilities available include a 6 MeV Linear Accelerator, a 112 MeV Linear Accelerator, and a 45 MeV Betatron producing bremsstrahlung X-ray beams of 6, 8, and 45 MeV and electron beam energies of 3-45 MeV.

In addition to the research facilities available within the Department of Physics, there are other supporting facilities in the College of Science and Mathematics. Among these are a Norelco X-ray diffraction system, a C.E.C. mass spectrometer, a Varian nuclear magnetic resonance apparatus, and a Zeiss electron microscope. Computer service is provided through the Research and Instruction Computation Center.

## Master of Science in Physics

### Admission

For admission to graduate study in physics, candidates must meet the requirements for admission as established by the School of Graduate Studies. In addition, the candidate must have a bachelor's degree in physics or comparable undergraduate preparation from an accredited institution and be recommended for admission by the departmental committee on graduate admissions. Students who do not hold a B.S. degree in physics should apply to the departmental committee on graduate admissions for evaluation of their training and experience.

## Degree Requirements

In addition to the requirements of the School of Graduate studies, the following requirements of the Department of Physics must be met:

- 1 Take an orientation examination before or during the first quarter of study, if asked. This examination is designed to evaluate the candidate's understanding of undergraduate physics. The results of this examination will be used by the advisory committee to establish the program of study.
- 2 Completion of a minimum of thirty-six credit hours in physics courses numbered 680 and above.
- 3 Completion of the core courses, quantum mechanics and theoretical physics, which are to be part of the thirty-six credit hours of number 2.
- 4 Completion of CS 210 or CS 145. This requirement may be waived if equivalent work has already been completed.
- 5 Pass a department final examination by the end of the last quarter of the degree program.
- 6 Presentation of an approved thesis. (*Note:* No more than fifteen credit hours of research credit may be counted toward the degree requirements.) Details concerning program selection, student evaluation, thesis requirements, and final examination may be obtained from the Department of Physics.

## Performance Standards

Graduate students in good standing in physics must maintain a cumulative average of 3.0. A grade of C is considered a minimum passing grade. Candidates whose average is below 3.0 after twelve hours of graduate work will be placed on probationary status; they will be removed from this status when the average of 3.0 is earned. Students whose average is below a 3.0 after eighteen hours of graduate work may be asked to withdraw from the program.

## Master of Science in Teaching

This program allows secondary teachers to increase their physics background so that they may capitalize on a diversified exposure to physics in their own teaching of students at the secondary school level. Further, it provides an opportunity for optional courses in the area of professional education so that proficiency in the presentation of scientific materials can be augmented.



## Admission

For admission to graduate study in the M.S.T. program, candidates must meet the requirements for admission as established by the School of Graduate Studies. In addition, for admission on a nonconditional status, candidates must have completed at least two years of college physics and have received certification to teach. Prior teaching experience is not required but is strongly recommended.

## Degree Requirements

In addition to the requirements of the School of Graduate Studies, the following requirements of the Department of Physics must be met:

- 1 Successful completion of a minimum of thirty-six credit hours of physics courses numbered 600 and above
- 2 Successful completion of a final examination by the end of the last quarter of the degree program
- 3 Presentation of a report on a satisfactory research project

## Research Project

Each student, under the direction of the advisory committee and an adviser approved by this committee, is responsible for planning and satisfactorily completing a research project in the areas of physics or the teaching of physics. This project may consist of one of the following:

- 1 Original experimental or theoretical research in an area of physics
- 2 Research into more effective means for the presentation of classroom material
- 3 Development of groups of classroom experiments or demonstrations
- 4 Writing texts or other classroom materials

## Physiology and Biophysics

See Biological Sciences

## Political Science and Urban Affairs

See Applied Behavioral Science

## Professional Psychology

Program information may be obtained from the School of Professional Psychology.

## Psychology

See Applied Behavioral Science, Professional Psychology

## Rehabilitation Counseling

See Education and Human Services

## Selected Graduate Studies

Under a carefully administered program, students may develop a proposal for a master's degree that is not available in any one existing program, but combines elements of two or more existing master's degree programs. Students interested in such a one-of-a-kind degree should contact the School of Graduate Studies for further information.

## Social Work

See Applied Behavioral Science

## Sociology/Anthropology

See Applied Behavioral Science

## Statistics

See Mathematics and Statistics



# Systems Engineering

The College of Engineering and Computer Science offers a graduate program in systems engineering leading to the Master of Science degree. The program is broad in scope, offering students the opportunity to concentrate in either electrical, mechanical, biomedical, or materials course areas. Incoming students will be asked to indicate a primary area of interest so that an appropriate academic adviser and home department can be identified.

## The Graduate Faculty

### Professors

James E. Brandeberry (dean), circuit and interface design, microprocessors, digital control, robotics and computer-aided design

Anthony J. Cacioppo, human factors engineering, human-machine interfacing involving aircraft control, instrumentation, and displays

Parviz Dadras, solid mechanics, manufacturing processes, composites

Amir Faghri, heat and mass transfer, fluid mechanics and analysis

Wilbur L. Hankey, computational fluid dynamics, aerodynamics, aerothermodynamics

Harry A. Lipsitt, materials engineering, high-temperature materials, intermetallics

Richard S. Millman, classical and differential geometry, modern control theory

Chandler A. Phillips, biomedical engineering, muscle biomechanics

Malcolm L. Ritchie (Emeritus), human factors engineering, engineering psychology

Blair A. Rowley, biomedical engineering, rehabilitation engineering, computer applications to augmentative communication, instrumentation, bioelectric effects of low-level electrical currents on tissue growth and healing

Shenoi, B. A., network theory, active and digital filters, communication circuits, digital signal processing, image processing

Joseph F. Thomas, Jr., materials engineering, mechanical behavior

### Associate Professors

Merrill L. Andrews, plasma physics, plasma laser media

Richard J. Bethke, biomedical engineering, signal and systems modeling and analysis, stochastic processes

Thomas N. Hangartner, biomedical engineering, medical imaging, CAT scanning, instrumentation, computers

Russell A. Hannen, electronic systems, control theory, stochastic processes

William S. McCormick, communication theory, bioengineering, electromagnetics, electro-optics

Gopal M. Mehrotra, materials engineering, ceramics, phase equilibria

Kuldip S. Rattan, computer-aided design, digital signal processing and control, bioengineering, robotics

David B. Reynolds, biomedical engineering, biofluid mechanics, engineering approaches to respiratory/pulmonary physiology

Raymond E. Siferd, VLSI, robotics and systems identification

George R. Spalding, systems identification, robotics, dynamics and control

Isaac Weiss, materials engineering, thermomechanical processing, powder metallurgy

### Assistant Professors

A. Subhash C. Bose, manufacturing, robotics, control systems

Lokesh Datta, digital signal and image processing, communications theory, digital systems

William C. Eppers, Jr., microwave circuits and measurements, lasers and electro-optics, electromagnetic theory

Billy W. Friar, thermodynamics, heat transfer, fluid mechanics

Ramana V. Grandhi, structural optimization, finite element methods, mechanical vibrations

Ping He, biomedical engineering, medical imaging, ultrasonics, instrumentation, computers

Marian K. Kazimierzczuk, electronics circuit analysis, high frequency, tuned power amplifiers

L. Rai Pujara, multivariable control systems, systems analysis

Arnab K. Shaw, communication theory and stochastic processes, estimation and detection, signal modeling and signal processing, simulation of communication systems

Kefu Xue, image processing and computer vision, stochastic processes and filtering, computer and communication systems, control and estimation theory

## Admission

Candidates for admission to the systems engineering program must satisfy the requirements of the School of Graduate Studies and have a bachelor's degree in engineering or a related area. For some students, particularly those with a degree in a related area, preliminary course work, in addition to the normal degree requirements, may be necessary.



## Facilities and Research

Engineering faculty members are engaged in a variety of research efforts in which graduate students may become involved. There are research programs in the general areas of electrical, mechanical, biomedical, and materials engineering. Some specific areas of emphasis include flight control systems, VLSI design, spacecraft cooling, optimization of structures, turbine engine materials, carbon-carbon composites, augmented communications, and medical imaging. Programs in artificial intelligence and robotics have college-wide interest and several faculty participate in the Edison Materials Technology Center. Graduate student research support is available in many of these programs.

Research in mechanical engineering spans several exciting areas. There is a large thermal science program in the analysis and application of heat pipes. A program in computational fluid dynamics involves studies of hypersonic flow and uses the newest supercomputers. There is an active program in optimization of large-scale structures including finite-element analysis. Mechanical design studies also are applied to characterization of carbon-carbon composites. Joint programs in manufacturing science include robotics and computer-vision studies which are well equipped including modern computer facilities.

Research in materials engineering emphasizes processing and high-temperature materials. Current programs include studies of ceramics and ceramic composites, intermetallics, nickel-based and titanium turbine engine alloys, and carbon-carbon composites. There are two high-temperature mechanical testing facilities, a thermogravimetric apparatus, and an ultra high temperature furnace (2800°C) for studying equilibrium and chemical reactions of ceramics. Related facilities for microscopy, heat treatment, mechanical testing, and data acquisition are excellent.

Research in biomedical engineering (BME) currently encompasses two main areas. These are medical imaging and rehabilitation engineering. Included are neural prosthesis for spinal cord injured rehabilitation, muscle biomechanics, ultrasound scanners with emphasis on soft tissue characterization, specialized CAT scanners with emphasis on sensitivity and imaging of bone, computerized augmentative communications for the disabled, applied bioelectric phenomena, and implantable prosthesis such as bladder control devices. Facilities include laboratories at the university and area hospitals. The Biomedical Imaging Laboratory and the Advanced Augmentative Communication Laboratory offer unique opportunities for research projects involving instrumentation, mechanics, and computers applied to medical and rehabilitation problems. Graduate

students in BME work on real-life problems. A course of study depends upon the student's previous education and interests and may involve forty-five to sixty quarter hours of study including a thesis for the M.S. degree.

Research in human factors engineering focuses on the generation of information related to human-system interface optimization. Typical activities include investigations of operator transition from automated to manual control; aircraft blind landing instrumentation; three-dimensional display designs, stereoscopic vision associated with virtual displays and human factors engineering applied to rehabilitation engineering.

Research in the digital control area is focused on redesign of existing flight-control systems, robotics, and computer vision. Research is also being conducted in pattern recognition and image processing.

Research in electronics includes efforts in rf and power electronics, and microwave devices. VLSI research includes design of I.C.'s for signal processing and computer architecture using NMOS and CMOS technologies.

Research at Wright State is not limited to the laboratory facilities on campus. Several industrial companies, laboratories, and Wright-Patterson Air Force Base are involved in joint research efforts with the university and have unique facilities that are available for faculty and graduate research.

## Degree Requirements

Degree candidates must plan a program of study that satisfies degree requirements and meets individual educational needs and career objectives. The program of study must be prepared in consultation with an adviser since there may be additional requirements or constraints based on the student's particular area of concentration. The program of study must be finalized by the time the student completes twelve credit hours of graduate study.

In compliance with the requirements of the School of Graduate Studies, the following requirements must be met for the M.S. degree in systems engineering:

- 1 Completion of forty-five graduate credit hours in courses that have prior approval by a systems engineering graduate adviser.
- 2 At least thirty-six of the total forty-five graduate credit hours must be engineering or computer engineering courses. At least twenty-four of these must be engineering courses.
- 3 At least twelve of the thirty-six graduate credit hours of engineering and computer engineering must be courses numbered above 700, excluding 899, Thesis.
- 4 At least six of the total forty-five graduate credit hours must be courses in mathematics, statistics, or computer science.



- 5 Students must choose either a thesis option or advanced course work option.

**Thesis Option:** A thesis satisfying all requirements of the School of Graduate Studies must be completed and successfully defended in an oral examination before the major committee. Up to twelve credit hours of 899, Thesis, may count toward degree requirements of forty-five total graduate credit hours and thirty-six graduate credit hours in engineering or computer engineering.

**Course Option:** Students must complete twelve credit hours of courses numbered 700 or above in engineering in addition to the twelve hours specified in requirement 3.

Students employed as teaching or research assistants through the School of Graduate Studies at any time during their degree candidacy must choose the thesis option.

## **TESOL/Teaching of English to Speakers of Other Languages**

See English Language and Literatures

## **Urban Affairs**

See Applied Behavioral Science

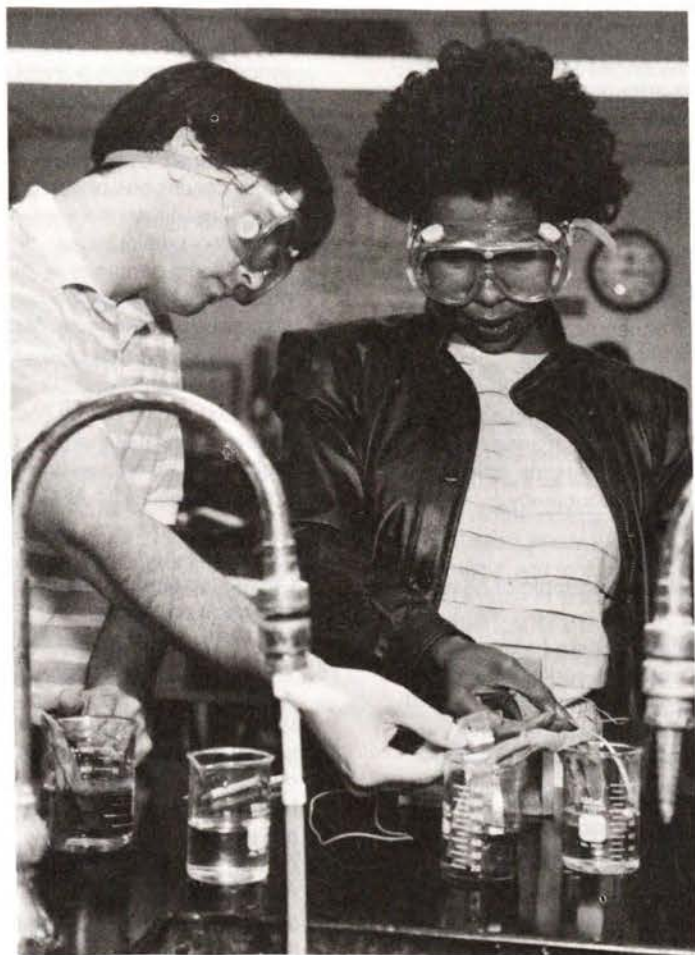
## **Urban Planning**

Contact the Department of Geography for information about this certification program.



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## GRADUATE COURSE DESCRIPTIONS





The course descriptions listed in this catalog represent the range of graduate courses offered at Wright State by the Colleges of Business Administration, Education and Human Services, Engineering and Computer Science, Liberal Arts, and Science and Mathematics; the School of Professional Psychology, the Wright State University-Miami Valley School of Nursing; and other graduate programs. For medical school courses see the *School of Medicine Catalog*, available in the medical school Office of Student Affairs/Admissions, 210 Medical Sciences. For undergraduate course descriptions see the *Undergraduate Catalog*, available in the Office of Undergraduate Admissions, 127 Student Services.

A list of course abbreviations and an explanation of the course numbering system can be found on page 42 and 43. Not all courses described here are offered every quarter or every year. For a more detailed listing of prerequisites, enrollment restrictions, and specific courses offered in a particular quarter, consult the Wright State class schedule published each fall, winter, spring, and summer quarter.

## Accountancy/ACC

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 621-3, 622-3 *Graduate Survey of Accounting I, II*

Survey courses in financial and managerial accounting respectively, for persons with no previous course work in accountancy. Prerequisite: for 622, ACC 621.

### 680-3 *Special Topics in Accounting*

Basic course in an accounting topic of current and timely interest.

### 711-3 *Financial Accounting Concepts I*

Study of financial accounting concepts and theory relating to the nature, measurement, and reporting of business income and financial condition. Emphasis on controversial areas of asset definition, recognition, and measurement. Prerequisite: ACC 622.

### 712-3 *Financial Accounting Concepts II*

Continuation of ACC 711 including the definition, measurement, and reporting of liabilities and stockholder's equity. Emphasis on controversial areas in the preparation of financial statements. Prerequisite: ACC 711.

### 713-3 *Financial Accounting Concepts III*

Study of financial accounting topics and theory including business combinations, consolidated financial statements, and accounting for foreign operations. Prerequisite: ACC 712.

### 721-3 *Federal Income Tax Accounting*

Study of the federal income tax and its effect on business decisions. Prerequisite: ACC 622.

### 723-3 *Managerial and Financial Information Systems*

Fundamental concepts of information processing with emphasis on systems used by management. Covers design, implementation, and operation of systems for computer applications. Prerequisite: MIS 621, ACC 712.

### 741-3 *Managerial Accounting*

Develops an understanding of accounting concepts and the use of accounting in relation to management planning and control. Emphasis on cost analysis for guidance in decision making. Prerequisite: ACC 622.

### 752-3 *Business Information Systems*

Study of accounting as a comprehensive information system that provides significant financial data needed by management for decision making and control as well as for reporting to outside interest groups. Prerequisite: ACC 741.

### 753-3 *International Accounting*

Identification, description, and analysis of the major dimensions of international accounting, concentrating on the fundamental patterns of accounting development discernible from an international perspective. Applied accounting problems of an international nature are discussed. Prerequisite: ACC 622.

### 754-3 *Financial and Operational Auditing*

Study of financial and operational auditing with emphasis on the theory underlying the development of standards, objectives, and procedures. Prerequisite: ACC 723, 741. (Previously listed as ACC 722.)

### 762-3 *Seminar in Income Tax Planning and Research*

Cases and studies in federal tax research with emphasis on tax planning. Prerequisite: ACC 721.

### 763-3 *Seminar in Behavioral Aspects of Managerial Accounting*

Research and discussion of the relationship between behavioral science issues and the management accounting function. Focuses on how accounting information and control systems are affected by the behavior of individuals, groups, and the culture of the firm. Prerequisite: ACC 741, MGT 700.

### 780-3 *Special Topics in Accounting*

Seminar in an accounting topic of current and timely interest. Topics vary.

### 781-3 *Independent Studies*



## Anatomy/ANT

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 520-5 *Anatomy of Human Motion*

Skeletal, articular, nervous, cardiovascular, and respiratory systems as they pertain to the muscular system are presented. Basic muscle actions are described; sequential muscle actions and other concepts of kinesiology are not discussed. Prerequisite: BIO 105, 107.

### 691-4 *Fundamentals of Human Neurobiology*

(Listed jointly with BMS 913.) Development, structure, and function of the human nervous system as it relates to neuropathology, clinical neurology, and behavioral science. Completion of general biology and/or general psychology courses and permission of instructor required.

### 699-1 to 4 *Special Problems in Anatomy*

A maximum of 4 credit hours applicable to degree requirements.

### 700-2 *Topics of Instruction in Human Anatomy*

Overview of gross anatomy, histology, neuroanatomy, embryology, and educational theory that enables students to be more effective in the teaching of undergraduate courses in anatomy. For first-year graduate teaching assistants in the Department of Anatomy only.

### 701-1 to 5 *Selected Topics in Anatomy*

Selected topics in anatomy. Topics vary.

### 711-8 *Human Gross Anatomy*

(Listed jointly with BMS 837.) Lectures and dissection of human cadaver; includes introductory embryology. 3.5 hours lecture, 9 hours lab.

### 715-2 *Advanced Human Embryology*

Classical and contemporary issues in human developmental biology. Students are assigned a minimum of two oral presentations. Additional presentations are made by faculty and outside speakers. Prerequisite: ANT 711.

### 721-6 *Human Microanatomy*

Detailed microanatomy of human cells, tissues, and organ systems. 3 hours lecture, 6 hours lab.

### 731-5 *Human Neurobiology*

(Listed jointly with BMS 903.) Detailed survey of the anatomy and physiology of the major fiber tracts and cell groups of the human central nervous system. 3 hours lecture, 4 hours lab.

### 732-3 *Cellular Neurobiology*

(Listed jointly with BMS 904.) Correlated ultrastructure, chemistry, and physiology of vertebrate neurons, neuroglia, and synapses under normal conditions and during development, degeneration, and regeneration.

### 800-1 *Graduate Seminar*

Topics vary. Graded pass/unsatisfactory.

### 850-3 *Scholarly Project I*

Intensive analysis of scientific literature with emphasis on content and organization of anatomical journal articles. Course concludes with oral presentations of student projects involving contemporary anatomical issues based on selected journal articles.

### 851-4 *Scholarly Project II*

Project culminates in a paper on a contemporary anatomical issue in which students integrate the primary objectives, results, and significance of selected journal articles and identify areas for potential research. Prerequisite: ANT 850.

### 899-1 to 14 *Graduate Research*

Supervised thesis research.

### 900-1 *Graduate Seminar*

Topics vary.

## Anthropology/ATH

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 542-4 *Sex and Gender: Cross-Cultural Perspectives*

Study of male and female roles and how they vary from one society to the next. Topics include sex and gender stereotypes, physical and behavioral differences, and cross-cultural differences in roles and status.

### 546-4 *Anthropology of Religion*

(Listed jointly with REL 546.) Anthropological approach to the meaning and function of religion in social life, and the nature of the thought or belief systems that gave rise to different forms of religious life. Emphasis on primitive and peasant societies.

### 569-6 to 12 *Field School in Archaeology*

Excavation training on prehistoric sites. Prerequisite: ATH 368 or equivalent.

### 599-1 to 4 *Studies in Selected Subjects*

Problems, approaches, and topics in the field of anthropology. Topics vary.

### 600-4 *Special Topics in Archaeology*

Advanced study of various specialized aspects of archaeology.

### 610-4 *Special Topics in Cultural Anthropology*

Method and theory of anthropological thought and their relationship to the allied disciplines of art, economics, history, linguistics, and politics. Emphasis on current trends influencing research in cultural anthropology. Topics vary.

### 646-4 *Peoples and Cultures of South Asia*

Survey and analysis of cultural diversity and unity in Southern Asia, particularly India, Pakistan, Bangladesh, and Sri Lanka.



**648-4 Development of Ethnological Thought**

Surveys historical development of ethnological thought; emphasizes theories of social and cultural change.

**650-4 Political Institutions in Primitive Societies**

(Listed jointly with PLS 650.) Study of that part of the culture of primitive societies that is recognized as political organization. An attempt is made to show how in less complex, primitive societies, new local communities come into being through fission.

**692-2 to 4 Directed Studies in Anthropology**

May be taken for letter grade or pass/unsatisfactory.

## Applied Behavioral Science/ABS

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information. For additional specialization courses, see course listings for political science, psychology, social work, sociology, and related areas.

**703-4 Human Service Delivery Systems**

Emphasis on the external environment and internal dynamics of human service delivery organizations.

**721-5 Quantitative and Research Methods in Applied Behavioral Science I**

Analysis and interpretation of data in evaluation research with emphasis on the appropriate statistical techniques. (Previously listed as ABS 722.)

**722-4 Quantitative and Research Methods in Applied Behavioral Science II**

Emphasis on research designs, testing hypotheses, and techniques for collecting data such as questionnaire formation, sampling, surveys, scaling, interviewing, and analysis of documents and records. (Previously listed as ABS 731.)

**723-4 Quantitative and Research Methods in Applied Behavioral Science III**

Emphasis on evaluation techniques, measuring program implementation, and identifying and measuring progress toward program objectives. (Previously listed as ABS 721.)

**741-4 Life Stages and Life Changes**

Acquaints students with life stages, typical patterns, and problems from infancy to death. Students research a topic in one stage of the life cycle.

**746-4 Community Development and Planning**

Basic concepts and theories of community development and the planning practice. Evaluation of current developments in the field with emphasis on implementation strategies.

**751-4 Organizational Training Development**

Organizational training is examined in the area of applied communication behavior as a procedure for human resource development. Focuses on needs assessment procedures, instructional design, implementation, job performance analysis, and structured implementation of organizational feedback.

**752-4 Process Consultation**

Examined from an applied communication behavior framework. Discussed as a part of the consulting process. Focuses on stages of consulting, models for process consultation, process observation and intervention, and process consultation outcomes. Prerequisite: ABS 751.

**756-4 Human Factors in the Systems Development Process**

Systems development process and human factors functions during this process are described. Both manual and computer-aided e.g., SAINT techniques are covered. Laboratory exercises require the use of selected techniques.

**761-4 Seminar in Social Deviance**

(Listed jointly with SOC 720.) Study of contemporary theories of deviant behavior from both an institutional and social-psychological perspective, with emphasis on the relationship between social change and social disorganization. Prerequisite: SOC 320 or 520 or permission of instructor.

**766-4 Work Motivation and Psychometric Assessment**

Description of research on human motivational processes and work activities. Research development and application of assessment and evaluation tests.

**775-4 Methods in Health Care Research and Evaluation**

Seminar in the designs and methods used in health care research and evaluation. Emphasis on current and future areas of health care research and evaluation. Focuses on skill development.

**777-1 to 5 Independent Research**

Independent laboratory or field research under the sponsorship of a faculty supervisor. Graded pass/unsatisfactory.

**779-2 to 6 Practicum in Applied Behavioral Science**

On-site participation of students in selected behavioral science projects. Jointly supervised by faculty and on-site personnel. Completion of core courses required.

**788-1 to 4 Graduate Seminar in Applied Behavioral Science**

In-depth coverage of special topics in applied behavioral science. Topics vary. May be taken for a letter grade or pass/unsatisfactory.



# 799-2 to 6 Graduate Thesis Research

Research for the master's degree thesis.

# 853-4 Workspace Design and Anthropometry

Analyses of design parameters for effective use of a work place. Includes seated and standing environments and considers hand-arm manipulation.

## Art and Art History/ART

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 600-1 to 4 Studio Workshop

Studio experience directly involving students with professional artists executing special projects. Covers a range of information from preliminary planning to final discussion on the projects.

### 601-1 to 4, 602-1 to 4, 603-1 to 4 Independent Study in Art

Special studies for qualified students. Intensive individually directed work in art with faculty consultation and supervision.

### 604-1 to 4 Studies in Art History

Provides opportunities to explore special problems and approaches to art history and includes cross-period and interdisciplinary studies. Titles vary.

### 605-1 to 4 Studies in Art

Provides opportunities to explore special problems and approaches to art and includes cross-media and interdisciplinary studies. Titles vary.

### 609-4 Studies in Art Theory and Criticism

Historical surveys and intensive studies in art theory and criticism.

### 610-4 Studies in American Art

General surveys and intensive studies of periods, major movements, and artists in American art. Titles vary.

### 611-4 Studies in Ancient and Classical Art

(Listed jointly with CLS 540.) General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 612-4 Studies in Medieval Art

General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 613-4 Studies in Renaissance Art

General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 614-4 Studies in Baroque Art

General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 615-4 Studies in Nineteenth-Century Art

General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 616-4 Studies in Twentieth-Century Art

General surveys and intensive studies of the period, major movements, and artists of the time. Titles vary.

### 627-4, 628-4, 629-4 Drawing

Exploration of the structure and interrelationships of visual form in drawing, painting, and sculpture. Principal historical modes of drawing are examined.

### 647-4, 648-4, 649-4 Painting

Emphasis on pictorial organization with increased attention to the individual student's personal imagery.

### 657-4, 658-4, 659-4 Photography

Exploration of personal concepts and aesthetic expression in photography. Intensive individual work with faculty supervision.

### 667-4, 668-4, 669-4 Printmaking

Development of personalized concepts and individual aesthetic expression in printmaking.

### 677-4, 678-4, 679-4 Sculpture

Development of personal concepts and aesthetic expression in sculpture. Emphasis on individualized approach to sculptural problems using media selected by the students.

### 697-4 Museology and Gallery Management

Supervised independent field experience and practical work in all areas of art museum management in the university and greater Dayton area communities.

### 701-1 to 4, 702-1 to 4, 703-1 to 4 Independent Study in Art History

Intensive individually directed work in art history with faculty consultation and supervision.

## Art Education/AED

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 611-4 Design: Process and Material

Advanced course in two- and three-dimensional design problems involving a wide range of techniques and materials related to teaching. Personal involvement in experimental approaches related to course problems.

### 620-4, 621-4, 622-4 Art Metal, Jewelry I, Jewelry II

620: development of skill in the manipulation of materials and tools for metal work. Creative problems in contemporary functional design. 621: creative designing and making of jewelry. Technique and craftsmanship for various materials. 622: advanced problems in the design and making of jewelry forms.



#### 623-4 *Fibers and Fabrics*

Introduction to fibers and fabrics as art forms. Basic techniques in various materials such as weaving, wrapping, twining, rya, batik, and other approaches to any school art program.

#### 624-4 *Weaving*

Use of loom and other hand techniques in weaving. Experimental approaches explored in the completion of original ideas.

#### 625-4 *Textiles*

Methods of silk-screen printing on fabrics; emphasis on silk-screen as it can be used in the public school program; and analysis of textile design in contemporary living.

#### 626-4 *Creative Stitchery*

Study of the various methods and procedures used in stitchery and appliqued forms, and exploration of ways to work with flat and stitched fabrics that lead to wall hangings and other art forms.

#### 628-4 *Pupil Expression through Mural Painting*

Development of individual creative expression through mural painting and the application of the mural technique to the public school program.

#### 629-1 to 6 *Workshop in Art Education*

Workshop dealing with problems, processes, and techniques for the development of art activities in the elementary and secondary school. Work consists of the development of craft processes concerned with suitable projects for classroom work and public art education curricula.

#### 630-3 *Independent Reading in Art Education*

Independent work that extends and amplifies students' knowledge of philosophy, aesthetics, and creative and mental growth as related to art teaching and art education curricula. Emphasis on current books, magazines, and research in art education.

#### 631-3 *Art and the Child*

Develops an understanding of child growth and development through creative expression. Emphasis on functions and procedures of art in the classroom, and experiences in drawing and painting.

#### 632-3 *Art and the Adolescent*

Develops an understanding of individual differences, psychological sets, and various roles of the adolescent as related to art and creativity. Curriculum planning, comparative theories, in-field observations, and analysis of art class content included. Prerequisite: AED 431 or permission of instructor.

#### 636-1 to 4, 637-1 to 4 *Minor Problems in Art Education*

Individual problems in specified areas for the purpose of intense and concentrated work in at least one medium and the development of proficiency in one or more craft areas.

#### 639-4 *Teaching Crafts in the School*

Seminar for advanced students includes teaching methodology, safety factors, toxic substances, and an overview of crafts courses generally taught in the public school. Prerequisite: ED 438 or 638 or equivalent.

#### 640-1 to 3 *Workshop/Field Trip in Art Education*

Survey of visual and performing arts. Visits to museums, galleries, and commercial sources of contemporary design and architecture. Participants are required to submit a written and/or visual evaluation of the places visited.

#### 641-4 *Art Appreciation and Criticism in the School*

Understanding the influences and interaction of the creative arts in our present culture. Emphasis on the importance of developing appreciation in the public school; study of the processes inherent in aesthetic criticism and their relationship to teaching in the arts.

#### 642-3 *Advanced Problems in Art Education*

Concentrated and advanced work with a specific art medium such as ceramics, metals, or fabrics. Emphasis on creative work and methods of teaching advanced procedures applicable to the public school art room.

#### 643-4 *Architectural and Environmental Awareness*

Combination seminar and studio focusing on curriculum development for the public school in architectural space and environmental awareness. Emphasis on human behavior and resources, ecology and human needs, and aesthetics and history.

#### 721-3 to 5 *Graduate Study in Crafts*

Individual problems in several craft areas to meet the needs of art teachers.

#### 731-4 *Theories and Philosophies in Art Education*

Critical evaluation of theories and philosophies in the field of art education in relation to the historical development of art education. Emphasis on translation and application to public school context.

#### 732-4 *Creative and Nonverbal Communication*

Study of the comparative relationship between the creative process and the human need for nonverbal communication as it affects art and education.

#### 734-3 *Art Education and Personality*

Human potentialities as related to the creative process are explored, with emphasis on human change resulting from creative expression and adjustment.

#### 741-1 to 3 *Art with the Gifted and Talented Student*

(Listed jointly with ED 723.) Orientation using art both theoretically and practically with students who are identified as being both extraordinarily gifted and talented in abilities.



**752-4 Research in Art Education**

Provides research techniques in art education from the initial planning stages to the completion of a thesis paper. Emphasis on the study of current and past research, current problems, and the development of a problem using appropriate research techniques. Prerequisite: ED 751.

**770-1 to 3 Independent Study**

Readings, project, participation/observation clinic experiences, or other appropriate study on an independent basis. Work is supervised by an art therapy faculty member.

**821-4 to 16 Special Problems in Art Education**

Advanced study in a specific creative area in art education. A written report of research and investigation is required.

**831-4 Supervised Art in the Public School**

Problems of teaching and supervising art in various types of communities and schools. Develops the ability to organize art materials and to interpret creative art methods.

**899-1 to 9 Thesis****Art Therapy/AT**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**629-1 to 6 Workshop in Art Therapy**

Workshop focusing on problems, processes, and techniques for the development of art therapy in special settings with diverse populations. Work in art media, assessment strategies, and treatment plans included. Implementation procedures with populations discussed.

**644-3 Art and the Special Student**

Theories and methods to help those who will work in the classroom or clinical setting with children who have emotional, motor, perceptual, or neurological problems. Philosophy, art media, and therapeutic procedures included. Developmental content and approaches with specific art media discussed. Prerequisite: AED 631 or equivalent, or permission of instructor.

**648-1 to 3 Arts for the Disabled and Handicapped Person**

Multidisciplinary, integrative approach to the various creative, expressive, and performing arts, and their applications to understanding of and working with persons with emotional, perceptual, neurological, and motor problems. Teaching/clinical strategies included. Prerequisite: AT 730 or permission of instructor.

**723-3 Art Media in the Special Setting**

Experiences with a variety of art media. Determination of strategies and media for use in expression, diagnostic evaluation, and remediation. Application of art media to various problems and settings. Prerequisite: AT 730 or permission of instructor.

**730-3 Art Therapy**

Study of the origin, historical development, and philosophy of the profession of art therapy. Comparative approaches to therapy and the application of the creative art process within the therapeutic framework.

**735-3 Art Therapy I: Theories and Methods**

Theories and application of art therapy in the assessment and diagnosis of developmental, neurological, psychological, and multiple disabilities. Direct clinical application of the visual arts in designing objectives and implementation of individual and group therapy sessions. Demonstration of clinical sessions and participation in therapy in on-campus and community settings.

**736-3 Art Therapy II: Theories and Methods**

Art therapy procedures and media selection for diverse clinical populations, settings, and handicapping conditions. Emphasis on group and family therapy processes, supervision, clinical reporting, and staff presentations. Application of audiovisual instrumentation to facilitate art therapy. Demonstration of clinical sessions and participation in therapy. Prerequisite: AT 735 or permission of instructor.

**738-3 Art Therapy III: Theories and Methods**

Art psychotherapy theories and methods for working with children, adolescents, and adults diagnosed as having emotional and psychological problems. Case studies included. Prerequisite: AT 730 or permission of instructor.

**739-3 Art Therapy IV: Theories and Methods**

Advanced art psychotherapy theory and methods for working with children, adolescents, and adults diagnosed as having emotional and psychological problems. Understanding of symbolic structures and references to projective methods in art psychotherapy included. Prerequisite: AT 738 or permission of instructor.

**743-1 to 3 Art with the Older Adult**

Orientation using art with older populations in varied settings. Study of aspects of aging, life review, death and dying, and application of appropriate media adaptations. Observation and participation experiences. Prerequisite: AT 730 or permission of instructor.



**744-1 to 3 Art with Exceptional Populations**

Orientation using art with a specific population such as learning disabled, mentally retarded, perceptually impaired, physically handicapped, culturally disadvantaged, multiple-handicapped, or persons in correctional institutions and prisons. Prerequisite: AT 730 or permission of instructor.

**746-3 Art Therapy with the Family**

Includes the systemic, family therapy theory, and the use of art therapy in strategic family intervention. Focuses on experiences in the practice of art therapy with a family, investigation of existing testing tools, and creative development of new tools. Clinical hours are included. Prerequisite: AT 730 or equivalent.

**748-3 Multicultural Dimensions of Art Therapy**

Explores the role of the arts in healing among various cultures. Examines how diverse cultural perspectives intersect in the therapeutic relationship. Includes exploration of personal and cultural values that undermine clinical work and cross-cultural implications for art evaluation and treatment. Prerequisite: AT 730 or equivalent.

**753-1 to 3 Research in Art Therapy**

Emphasis on the qualitative/quantitative aspects of research in art therapy with focus on the case study method, observational and phenomenological procedures, and the longitudinal study in a clinical setting. Prerequisite: AT 730, ED 751, or permission of instructor.

**766-1 to 5 Project in Art Therapy**

Independent study intended for graduate students who elect to complete the program in art therapy with a major project. Prerequisite: AT 753 or permission of instructor.

**770-1 to 3 Independent Study in Art Therapy**

Readings, project, observation, or other appropriate study on an independent basis. Work is supervised by an art therapy faculty member. Prerequisite: AT 753 or permission of instructor.

**771-1 to 3 Art Therapy Clinic I**

On-campus clinical art therapy experience under the supervision of a registered art therapist. Prerequisite: AT 735.

**772-1 to 9 Art Therapy Clinic II**

Off-campus art therapy internship. Students are assigned to a specific school, agency, hospital, or institution for art therapy clinical experience under the supervision of a registered art therapist. Prerequisite: AT 771. Corequisite: AT 774.

**773-1 to 5 Art Therapy Clinic III**

Extended on-campus or off-campus clinical experiences intended for students who elect to complete the degree with additional clinical hours. Prerequisite: AT 771, 772, or permission of instructor. Corequisite: AT 774.

**774-1 to 3 Seminar in Art Therapy**

Seminar for group discussion of students' clinical art therapy experiences. Includes analysis of clinical case load assessment, therapy, and recommendations for patients or clients. Preparations for in-service presentation for clinical team members. Prerequisite: AT 771. Corequisite: AT 772, 773.

**899-1 to 9 Thesis****Biochemistry/BCH**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**510-5.5 Introductory Biochemistry**

Introduction to general principles of biochemistry, especially for students interested in the allied health sciences. Topics include the chemistry of biological molecules, cellular metabolism, and the mode of action of selected chemicals at the biochemical level. Not open to graduate students in the College of Science and Mathematics. Prerequisite: CHM 102 or 141.

**621-4.5 Biochemistry I**

Biochemistry of proteins, enzymes, and carbohydrates. Organic chemistry or permission of instructor required.

**622-3 Laboratory for Biochemistry I**

Quantitative techniques in biochemistry; chemical and instrumental methodology. Corequisite: BCH 621 (may be taken separately with permission of instructor).

**623-4.5 Biochemistry II**

Biochemistry of proteins, nucleic acids, and lipids. Prerequisite: BCH 621.

**624-3 Laboratory for Biochemistry II**

Properties of enzymes, enzyme-catalyzed reactions, and application of isotopes to the study of metabolism. Corequisite: BCH 623 (may be taken separately with permission of instructor).

**627-4.5 Human Biochemistry**

Metabolism of hormones and amino acids, integration of metabolism, and aspects of human biochemistry including some metabolic disorders and nutrition. Prerequisite: BCH 623 or permission of instructor.

**631-4.5 Clinical Biochemistry**

Application of biochemical knowledge to a thorough understanding of disease states. Builds on material presented in BCH 621 and 623. Prerequisite: BCH 623 or permission of instructor.



### 651-3 *Recent Developments in Biochemistry*

Detailed consideration of major research developments in biochemistry within the past several months. Discussion deals not only with the appropriate research papers, but also with the background information such articles leave out. Prerequisite: BCH 621 and 623; or BMS 751 and BCH/BMS 752; or permission of instructor.

### 699-1 to 4 *Special Problems in Biological Chemistry*

Graded pass/unsatisfactory.

### 701-1 to 5 *Selected Topics in Biological Chemistry*

#### 702-2 *Research Perspectives*

Designed to acquaint new graduate students with the research being carried out by the faculty in the biochemistry program.

### 726-1 to 6 *Bioenergetics*

(Listed jointly with BMS 776.) Structure of energy transducing membranes of mitochondria, chloroplasts, and bacteria. Emphasis on mechanisms of energy transduction, thermodynamics of oxidation-reduction reactions, biophysical spectroscopic methods, and structure and surface topography of membrane proteins. Prerequisite: BCH 423 (623) or BMS 752.

### 727-3 *Enzymes*

(Listed jointly with BMS 767.) Current concepts of the mechanism of enzyme catalysis including such topics as structure, kinetics, energetics, allosterism, coenzymes, and control of enzymes and multienzyme systems.

### 729-3 *Biochemistry of Peptide Hormones*

(Listed jointly with BMS 768.) Synthesis, secretion, degradation, structure, assay, mechanism of action, and function of peptide hormones are presented. Emphasis on insulin and other hormones (e.g., glucagon, somatotropin, and somatostatin) involved in diabetes mellitus. Prerequisite: BCH 621, 623; or equivalent.

### 731-3 *Biochemistry of Membranes*

(Listed jointly with BMS 769.) Examines the biochemistry of membranes and provides basic information on membrane composition and processes. Prerequisite: BCH 421 (621), 423 (623).

### 736-6 *Recombinant DNA Methods*

(Listed jointly with BIO 737 and BMS 790.) Microbial and molecular techniques for producing, cloning, and characterizing recombinant DNA molecules; laboratory exercises in gene manipulation to give an understanding of genetic engineering principles. Graded pass/unsatisfactory. Prerequisite: BMS 750, 752; BIO 654 (BMS 791) and BIO 734 (BMS 779); or permission of instructor.

### 740-3 *Biological Macromolecules*

Structure-function analysis of biological macromolecules (particularly proteins and polynucleotides) based on their chemical and physical properties. Prerequisite: BCH 421 and 423, or equivalent.

### 743-2 *Radioisotope Principles*

(Listed jointly with BIO 743.) Principles of  $\alpha$ ,  $\beta$ , and  $\gamma$  radiation and methodology of counting, with application to physical and biological problems.

### 750-5 *Molecular Biochemistry I*

(Listed jointly with BMS 770.) Survey course emphasizing an experimental and problem-solving approach to buffers, protein structure, enzymes, and carbohydrate and lipid metabolism. Completion of organic chemistry course or permission of instructor required.

### 752-5 *Molecular Biochemistry II*

Survey course emphasizing an experimental and problem-solving approach to amino acid metabolism, nucleic acid function, and hormones. Prerequisite: BCH 750 or permission of instructor.

### 755-2 to 6 *Cancer: Molecular Aspects*

(Listed jointly with BMS 755.) Profile of the general properties of transformed cells and an in-depth examination of the mechanisms of oncogenesis at the level of molecular genetics. Prerequisite: BCH 421, 423, or equivalent.

### 760-4 *Magnetic Resonance in Living Systems*

(Listed jointly with BMS 760.) Nuclear magnetic resonance (NMR) is presented as a method of studying the metabolism and function of living systems at the molecular level. Specific applications to cells, tissues, animals, and people are considered. Prerequisite: BCH 623 or 752 or permission of instructor.

### 761-4 *Magnetic Resonance Imaging*

(Listed jointly with BMS 761.) Magnetic resonance imaging (MRI) is presented as a noninvasive method for clinical diagnosis and biomedical research. Basic principles of MRI and specific applications of the technique are considered. Prerequisite: BCH 760 or permission of instructor.

### 771-3 *Protein and Vitamin Nutrition*

(Listed jointly with BMS 931.) Examination of the utilization and function of proteins, amino acids, and vitamins in the nutrition of the organism. Although some reference is made to microbial systems, emphasis is on these processes as they occur in birds and mammals.

### 800-1 *Biochemistry Seminar*

Topics vary. Graded pass/unsatisfactory.



**826-4 to 5 Human Heritable Metabolic Diseases**  
(Listed jointly with BMS 772.) Biochemical mechanisms of human inherited diseases and organ metabolism to genetic change and to physiological responses. Students who wish to complete a special research project should register for 5 credit hours.

**899-1 to 15 Biochemistry Research**

**900-2 Seminar in Biological Chemistry**

Topics vary. Prerequisite: BCH 621, 623, or equivalent; or permission of instructor.

## Biological Sciences/BIO

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**521-3 Human Genetics for Health Professionals**

Describes mechanisms of inheritance and genetic diseases so that health professionals can recognize possible genetic abnormalities and make appropriate referrals, participate in genetic counseling, and consider ethical and legal implications of the "new genetics." For nonmajors only. Prerequisite: BIO 112 or equivalent or graduate standing.

**603-3 Developmental Biology**

(Listed jointly with BMS 839.) Describes underlying processes that initiate, in plants and animals, the development of tissue and whole organisms.

**606-3 Evolutionary Biology**

Historical development and current understanding of the principles of evolution. Prerequisite: BIO 111, 112, 114, 302, or permission of instructor.

**611-6 The Aquatic Environment**

Field and laboratory course concerned with the physical, chemical, and biological factors that determine biological productivity in natural waters. 3 hours lecture, 6 hours lab.

**612-6 Aquatic Communities**

Analysis of the functional relationships of organisms with the aquatic environment with emphasis on species interactions. 3 hours lecture, 6 hours lab, field trips.

**613-5 Biological Problems of Water Pollution**

Introduction to the biological aspects of water pollution. Lectures, discussions, laboratories, and field trips cover the various types of pollutants and their impact on aquatic life. 3 hours lecture, 4 hours lab, required field trips.

**614-5 Terrestrial Communities**

Organization, diversity, distribution, and abundance of animals in plant communities, with regard to terrestrial insect-plant relationships. Laboratories and field trip acquaint students with various techniques used for ecological studies of population and community dynamics in natural environments. 3 hours lecture, 4 hours lab.

**615-4 Environmental Toxicology**

Covers toxicological problems encountered in the field of environmental health. Emphasis on monitoring, control, and regulation of toxic substances in air and water, and in industrial environments. 3 hours lecture, 1 hour recitation. Completion of a course in physiology and organic chemistry required.

**616-3 Principles of Ecotoxicology**

Covers the various types of ecotoxins and their impact on aquatic and terrestrial organisms. Emphasis is on types and sources of toxicants, their uptake, accumulation, excretion, and biological effect. Completion of a course in organic chemistry and physiology required.

**617-4 Evolution**

(Listed jointly with REL 617.) An introduction to the biological, philosophical, theological, and ethical aspects of the concept of evolution.

**618-4 Methods in Environmental Toxicology**

(Listed jointly with BMS 893.) Study of methods used to study toxic effects of chemical and physical agents on living organisms. Emphasis is on those that affect populations and communities within natural ecosystems, but can be used to indicate potential toxicity for humans. Prerequisite: BIO 415 (615) or 416 (616).

**620-3 Designing Biological Experiments**

Principles of effective sampling design for biological experiments. Reconciling the peculiarities of biological data with the assumptions of statistical methods. Lectures and problem sets. Completion of two biology courses at 300 level or above and one course in statistics required.

**622-1 Ethics in Genetic Counseling**

Focuses on ethical problems confronted by those who give genetic counseling. Problems in screening, amniocentesis, and genetic manipulation are also considered. Prerequisite: BIO 105 or 112 or 302 or equivalent. Corequisite: REL 578.

**625-5 Microbial Ecology**

(Listed jointly with BMS 793.) Microbes in soil, water, and air. Experiments on mineral cycles, physical and biological limiting factors, and symbiosis. Natural communities of microbes and microbes of special human environments. Includes field studies.



**626-4 Human Genetics**

(Listed jointly with BMS 780.) Nature of human genetic traits; methods of analysis of inheritance. Prerequisite: BIO 302, 402, or 403.

**630-3 Radiation Biology**

Introductory study of the nature of ionizing radiation, its biological effects, and its applications to biological problems. Prerequisite: BIO 403, CHM 213, MTH 131, PHY 113, or permission of instructor.

**632-3 Plant Biochemistry**

Detailed study of the biochemistry of photosynthesis, respiration, and other metabolic and biosynthetic processes in plants.

**654-3 Microbial Genetics**

(Listed jointly with BMS 791 and M&I 654.) Basic concepts of production of microbial mutations, and their detection and analysis; the use of microbial genetics in elucidating cellular functions; and the construction of plasmids and their use in genetic engineering. Prerequisite: BCH 421 or 423 or BIO 402; BIO 202, 302; or permission of instructor.

**655-3 Plant Systematics**

Survey of topics and techniques encountered in studies of the relationship and evolution of the higher plants with emphasis on the flowering plants. Prerequisite: BIO 204 or permission of instructor.

**656-3 Microbial Genetics Laboratory**

(Listed jointly with BMS 792.) Familiarizes students with microbial genetics techniques. Corequisite: BIO 654.

**664-3 Microbiology of Food**

Principles of food microbiology, preservation, and handling. Major organisms of food poisoning and means of control are considered. Completion of a microbiology course required.

**666-3 Occupational Health and Safety**

Introduction to accident recognition, evaluation, and control in the work environment, with emphasis on methods of hazard recognition and control management. Prerequisite: CHM 141, MTH 130.

**667-2 Occupational Health and Safety Laboratory**

Introduction to accident recognition, evaluation, and control in the work environment by "hands on" type of equipment usage. Methods of inspection, accident investigation, and evaluation of accident programs are stressed. Prerequisite: CHM 141, MTH 130.

**668-3 Industrial Hygiene I**

Introduction to industrial hygiene. Emphasis is on routes of entry into the human body and physiological effects of industrial pollutants. Prerequisite: CHM 141, 211, 215; MTH 130.

**669-2 Industrial Hygiene I Laboratory**

Introduction to industrial hygiene. Methods of measuring toxic effects and providing adequate protection are discussed and demonstrated. Prerequisite: CHM 141, 211, 215; MTH 130.

**673-5 Biology of Selected Marine Environments**

Biological aspects of marine environments. Sampling and observation of living marine specimens during week-long trip to a marine laboratory.

**675-2 Microbiology of Food Laboratory**

Methods for evaluating microbial quality of food. Includes investigation of major pathogens, techniques, and principles of processing food. Field trips required. Completion of a laboratory course in general microbiology required. Prerequisite: BIO 202 or M&I 220. Corequisite: BIO 664.

**676-2 Human Parasitology**

(Listed jointly with BMS 799.) Study of the medical aspects of parasitology, such as pathology, symptomatology, diagnosis, and identification of parasites. Course content is divided into three major categories: human protozoology, human helminthology, and human anthropology. Designed primarily for medical technologists, biology teachers, and environmental health students.

**677-3 Human Parasitology Laboratory**

Laboratory course designed to examine and identify protozoan, helminthic, and arthropod parasites of humans. Corequisite: BIO 676.

**678-4 Animal Behavior**

(Listed jointly with PSY 678.) Physiology, phylogeny, and ontogeny of behavior. 3 hours lecture, 2 hours lab. Prerequisite: PSY 111, 112; or BIO 111, 112, 114, 305; and permission of instructor.

**680-5 Biology of Fishes**

Introduction to the evolution, ecology, and distribution of fresh water and marine fish. 3 hours lecture, 4 hours lab, and field trips. Prerequisite: BIO 206, 306, or permission of instructor.

**684-3 Introduction to Biogeography**

Introduction to the factors affecting the distribution of plants and animals. Prerequisite: BIO 111, 112, 306 or permission of instructor.

**686-3 Industrial Hygiene II**

Evaluation of the health effects of fumes, smoke, gases, dusts, and mists in the work place. Consideration of effects of radiation and noise. Prerequisite: BIO 668, 669; CHM 141, 211, 215; MTH 130.



**687-2 Industrial Hygiene II Laboratory**

Evaluation of the health effects of fumes, smoke, gases, dusts, and mists in the work place. Methods of detection and control are emphasized. Prerequisite: BIO 668, 669; CHM 141, 211; MTH 130.

**699-1 to 4 Special Problems in Biology**

**700-3 Principles of Instruction in Biology**

Survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For biology majors only.

**701-1 to 5 Selected Topics in Biology**

Topics vary.

**702-2 Introduction to Research**

Different research problems under investigation by the faculty are described with respect to objectives, methodology, and progress as examples of scientific methods applied to biology.

**720-5 Cell Biology**

(Listed jointly with BMS 835.) A comprehensive course addressing both the known and theoretical aspects of cellular organization and function. Suitable as an introductory course for graduate study.

**724-3 Cell Physiology**

Behavior of the cell and its constituents in the expression of the characteristic properties of life. Metabolism, reproduction, and motion are studied.

**728-3 Photobiology**

(Listed jointly with BMS 775.) Topics vary.

**734-3 Molecular Genetics**

(Listed jointly with BMS 779.) Study of the replication, organization, and function of nucleic acids with emphasis on the role of nucleic acids in protein synthesis.

**735-2 Advanced Seminar in Genetics**

(Listed jointly with BMS 785.) Review of current literature in molecular or human genetics subjects. Presentation of reviews to other students. Completion of a course in biochemistry required. Prerequisite: BIO 626 or 654.

**736-3 Phytohormones**

Hormonal regulation of plant growth and development.

**737- Recombinant DNA Methods**

(Listed jointly with BCH 736 and BMS 790.) Microbial and molecular techniques for producing, cloning, and characterizing recombinant DNA molecules; laboratory exercises in gene manipulation to give an understanding of the principles of genetic engineering. Graded pass/unsatisfactory. Prerequisites: BMS 750, 752; BIO 654 and BIO 734/BMS 779 or permission of instructor.

**738-3 Behavior Genetics**

(Listed jointly with BMS 786.) Behavior is considered as a population phenomenon and as an adaptive process. Evolutionary theory is used to integrate the disparate aspects of behavioral phenomena. Prerequisite: BIO 302.

**740-6 Electron Microscopy for Life Sciences**

(Listed jointly with BMS 834.) Introduction to theoretical and practical aspects of transmission electron microscopy. Emphasizes interpretation and evaluation of electron micrographs. 3 hours lecture, 6 hours lab; additional lab time is required. Completion of course in histology or cell biology is required.

**743-2 Radioisotope Principles**

(Listed jointly with BCH 743.) Principles of  $\alpha$ ,  $\beta$ , and  $\gamma$  radiation and methodology of counting, with application to physical and biological problems.

**745-4 Microinstrumentation**

Equipment and technique used for the microscopic examination of biological structure and ultrastructure. 2 hours lecture, 4 hours lab.

**800-1 Graduate Seminar**

Topics vary.

**828-4.5 Microbial Physiology**

(Listed jointly with M&I 721.) Emphasizes the physiological, morphological, and biochemical activities of microorganisms. Nutrition, survival, culture variation, and action of antimicrobial agents are related to structure and function.

**829-4.5 Microbial Physiology Laboratory**

Emphasizes physiological, morphological, and biochemical activities of microorganisms in a laboratory situation. Nutrition, survival, culture variation, and action of antimicrobial agents are related to structure and function in microbial model systems. Corequisite: BIO 828.

**845-3 Biochemistry of Natural Products**

Studies the development of natural products as antibacterial and antifungal agents with emphasis on mode of action and biosynthesis. Their roles in chemotherapy of infectious diseases and in the elucidation of basic biochemical reactions are stressed.

**899-2 to 18 Graduate Research**

Supervised thesis research.

**900-1 Graduate Seminar**

Topics vary.



## Biomedical Engineering/BME

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 506-4 *Engineering Psychology*

(Listed jointly with PSY 506.) Introduction to the study of human factors in the design and operation of machine systems. Prerequisite: PSY 111, 112. (Previously listed as EGR 506.)

### 619-3 *Biomedical Engineering Systems I*

Application of engineering and mathematical techniques in the derivation of the basic laws underlying biophysical systems. Topics include transport theory and electrical properties of cell membranes, and control theory applied to regulation of body functions. Prerequisite: MSE 213, MTH 233, P&B 702. (Previously listed as EGR 619.)

### 620-3 *Biomedical Engineering Systems II*

Application of the mechanics of fluids and solids together with thermodynamic principles in formulating the basic equations governing cardiovascular and pulmonary functions. Topics include rheology, hemodynamics, lung aerodynamics, cardiac mechanics, and system interactions. Prerequisite: BME 619, P&B 703. (Previously listed as EGR 620.)

### 622-3 *Engineering Biophysics*

Application of mathematical and engineering techniques toward describing biophysical systems. Topics include cellular transport, electrical properties of membranes, and regulation of blood pressure and body temperature. Prerequisite: ESE 521.

### 628-3 *Biomechanics and Biofluids*

Application of solid and fluid mechanics and thermodynamics toward describing physiological systems. Topics include muscle contraction, cardiac mechanics, hemodynamics, and whole body heat transfer. Prerequisite: ESE 521.

### 639-4 *Biotransport and Artificial Organs I*

Introduces transport processes vital to the design of medical devices for artificial intervention into living systems. Topics include circulatory system dynamics, mathematical modeling of physiological systems, membrane transport, and biological/artificial organ design. Prerequisite: BME 620.

### 640-4 *Biotransport and Artificial Organs II*

Advanced topics in transport processes essential to the design of medical devices that support living systems. Topics include the human thermal system and heat transfer, hemodialysis, and mass transport of renal and hepatic systems. Prerequisite: BME 639.

### 650-3 *Human Factors Engineering Analysis Methods*

Covers a variety of engineering and behavioral analytic techniques critical to the study of work performance. Prerequisite: BME 306 (506).

### 660-3 *Design and Analysis of Engineering Experiments*

Introduction to the planning and analysis of engineering experiments. Covers basic topics required for experimental work and their applications to engineering problems. Includes brief coverage of basic statistics, probability distributions, tests of hypotheses, linear regression and analysis of variance, and the application of these tools using randomized block, factorial, and fractional factorial experimental designs in the investigation of engineering problems. (Previously listed as EGR 660.)

### 661-4 *Bioinstrumentation I*

Part I of a two-part sequence involving principles of design and analysis of electric instrumentation for biological applications. Topics include transducers, electrodes, signal processors, image processing, and electrical safety. Prerequisite: ESE 641.

### 662-4 *Bioinstrumentation II*

Part II of a two-part sequence involving principles of design and analysis of electronic instrumentation for biological applications. Topics include transducers, electrodes, signal processors, image processing, and electrical safety. Prerequisite: BME 661.

### 663-3 *Biomedical Computers I*

Digital computer applications in medical sciences involving medical research, patient care, and physician assistance. Topics include medical data bases, medical expert systems, and data structures for patient care. Prerequisite: ESE 641.

### 664-4 *Biomedical Computers II*

Digital computer (hardware) applications in the health care field. Topics include hospital/operating room computer systems; microprocessors in clinical and medical research laboratories; and computers in rehabilitation engineering. Prerequisite: BME 663 or permission of instructor.

### 665-3 *Medical Imaging*

An overview of the various methods used in generating images in medicine. The basic principles of the image-forming process and the physical properties of the resultant images are discussed. Prerequisite: PHY 242.

### 671-4 *Systems Models in Human Factors Engineering*

Studies quantitative means of analyzing and predicting human performance, particularly for human-machine interactions. Topics include estimation theory, control theory, queueing theory, and fuzzy set theory. Prerequisite: ESE 425, PSY 400 or STT 363. Corequisite: ESE 626. (Previously listed as EGR 671.)



**676-4 Human Factors Engineering in Aerospace System Design**

Application of human factors engineering concepts to aerospace systems design. Develops human factors engineering influence on aerospace system dynamics, structure, and control as well as impact on reliability and maintainability. Prerequisite: BME 471.

**699-1 to 5 Special Problems in Engineering**

(Listed jointly with ESE 699, EGR 699, and MSE 699.) Special problems in advanced engineering topics. Titles vary.

**700-3 Principles of Instruction in Engineering**

(Listed jointly with ESE 700 and MSE 700.) Survey of available instructional materials and discussion of educational theories and techniques leading to more effective instruction. For first-year graduate teaching assistants only. (Previously listed as EGR 700.)

**711-3 Cardiac Mechanics**

Covers a variety of mathematical models that have been developed to describe cardiac performance in health and disease.

**712-3 Cardiopulmonary Modeling**

Acquaints students with the analytical, numerical, and experimental methods used in modeling the quantitative behavior of physiological and artificial organ systems, particularly the circulation and the lungs. Prerequisite: BME 440, 439 or BME 640, 639.

**713-3 Biocompatibility of Materials**

Acquaints students with the concept of biocompatibility of materials, including effects on biological systems. Also deals with the general problem of selection, qualification, and specification of materials. Prerequisite: BME 440, BIO 209 or equivalent.

**723-2 Human Factors Engineering in Aerospace Medicine**

Designed for Residents of the Aerospace Medicine program. Focuses on recent developments in human factors engineering. Design principles, crew compartment technology and resource management, crew member performance and reliability are discussed. Open to Residents of the Aerospace Medicine program only.

**724-3 Human Factors Engineering Advanced Aerospace Systems Design**

Qualifies students to make significant human factors contributions to the design of state-of-the-art aerodynamic and space systems. Emphasizes the design of control-display integration, cockpit configuration, maintainability, and reliability. Prerequisite: BME 676.

**725-3 Human Factors Engineering Workload Analysis**

Provides required tools needed to accomplish a workload analysis as a requisite to a systems design or a redesign of an existing system. Prerequisite: BME 650.

**726-3 Human Factors Engineering: Crew Station Design**

In-depth treatment of human factors engineering principles applicable to design of crew command centers for aerodynamic, space, and maritime systems. Prerequisite: BME 676.

**731-3 Medical Ultrasonics**

Fundamentals of medical ultrasonics: ultrasound generation, propagation, scattering, and attenuation in biological tissue. A-mode, B-mode, M-mode, and Doppler imaging techniques. Ultrasound tissue characterization and quantitative imaging techniques. Prerequisite: BME 665.

**732-3 Computed Tomography**

Principles of generating images from projections. Discussion of the various scanner geometries, mathematical reconstruction, correction procedures, and qualitative and quantitative evaluation of images. Focuses on the medical application of computed tomography. Prerequisite: BME 665.

**733-3 Nuclear Magnetic Resonance in Medicine**

Principles of imaging and spectroscopy of nuclear magnetic resonance in their applications to medicine. Topics include magnetization models, material encoding, spin interactions, localized spectroscopy, and relaxation. Prerequisite: BME 665.

**734-3 Processing of Medical Images**

Digital image processing in its application to medical images. Topics include image display, filtering, two-dimensional Fourier transform, restoration, enhancement, and edge detection. Some simple tools from the field of mathematical morphology are also introduced. Prerequisite: BME 665.

**735-3 Photon Emission Imaging**

Principles of imaging procedures based on radioactive isotopes. Topics include radioactive isotopes, single-photon emission-tomography, and positron emission-tomography. Each topic covers instrumentation, image production, and major applications. Prerequisite: BME 665.

**741-3 Neuromuscular Rehabilitation Engineering**

Teaches the design and application of neuromuscular assistive devices. Emphasizes biomathematics modeling and control theory.

**742-3 Rehabilitation Assistive Systems**

Design and application of devices used in rehabilitation. Provides an understanding of the problems of disabled people and the variety of possible solutions to these problems.



**743-3 Application of Human Factors Engineering to Rehabilitation**

Teaches the application of human factors design concepts for designing aids for the physically handicapped. In addition to manipulation and locomotion aids, barrier-free designs are emphasized. Prerequisite: BME 472.

**766-4 Advanced Biomedical Computers**

(Listed jointly with BMS 701.) Digital computer (hardware) applications in the health care field. Topics include hospital, operating room, clinical lab, medical research lab, and rehabilitation engineering computer systems. 3 hours lecture, 2 hours lab. Prerequisite: ESE 641. (Previously listed as EGR 766.)

**777-4 Biomedical Electronics**

(Listed jointly with BMS 721.) Introduction to electronics for life scientists. Topics include AC/DC circuits, semi-conductor and operational amplifier theory, digital devices and microprocessors, computer applications, biological transducers, and bioinstrumentation. 3 hours lecture, 2 hours lab. (Previously listed as EGR 777.)

**880-3 Selected Topics in Systems Engineering**

(Listed jointly with ESE 880 and MSE 880.) Selected topics in current research and recent developments in systems theory and engineering. (Previously listed as EGR 880.)

**890-1 to 5 Special Problems**

(Listed jointly with ESE 890, EGR 890, and MSE 890.) Special problems in advanced engineering topics. Topics vary.

**899-1 to 5 Thesis**

(Listed jointly with ESE 899, EGR 899, and MSE 899.)

**Biomedical Sciences/BMS**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**655-5 Matrix Algebra**

(Listed jointly with MTH 655.) Matrices, systems of equations, vector spaces, inner products, linear transformations, determinants, eigenvalues, eigenvectors, quadratic forms, and symmetric matrices. Prerequisite: BMS 664, 698.

**664-4 Biostatistics**

(Listed jointly with SST 664.) Review of the principles underlying statistical methodology and techniques available for analyzing biomedical data. Emphasizes the necessity for careful design of experiments and the structure of data.

**668-2 Introduction to SAS**

Introduces the use of the statistical analysis system (SAS), a statistical computing package widely used in industry, government, and academia. Prerequisite: BMS 664 or equivalent.

**674-3 Mathematical Modeling of Biosystems**

Basic introduction to the use of quantitative methods to model biological phenomena. Problem examples are drawn from the molecular, cellular, and system levels of biological organization. Graded pass/unsatisfactory.

**698-4 Computer Science**

Introduces personal computers and various software packages. Introduces communicating with and running various software packages on a large computer. Prerequisite: Enrollment in the BMS Ph.D. program.

**701-4 Advanced Biomedical Computers**

(Listed jointly with BME 766.) Digital computer (hardware) applications in the health care field. Topics include hospital, operating room, clinical laboratory, rehabilitation engineering, and medical research laboratory computer systems. 3 hours lecture, 1 hour lab. Prerequisite: ESE 641.

**702-4 Control Systems I**

(Listed jointly with ESE 625.) Introduction to control systems using state variables and classical analysis. Closed loop system representation, block diagrams, time response, and frequency response are treated. 3 hours lecture, 3 hours lab. Prerequisite: BMS 664, 698.

**703-2 to 6 Control Systems II**

(Listed jointly with ESE 626.) System stability and closed loop response are analyzed using Routh-Herwitz, Nyquist, and root locus techniques. System specifications and compensation are realized using state variables and classical analysis. 3 hours lecture, 3 hours lab. Prerequisite: BMS 702.

**705-3 Linear Systems I**

(Listed jointly with ESE 701.) Includes signal representation, orthonormal families of signals, and generalized Fourier series; generalized functions, the impulse function, and calculus of generalized functions; superposition and convolution of signals; the Fourier transform; sampled and periodic signals and their associated spectra; fast Fourier transform; time limited and band limited signals—sampling theorems, and uncertainty principle. Prerequisite: BMS 664, 698.

**706-3 Linear Systems II**

(Listed jointly with ESE 702.) Differential equation description of a linear system; degenerate and nondegenerate systems; decomposition of an  $n$ th order linear system; state equations; transition matrix; and input/output relations. Prerequisite: BMS 705.



**708-3 Digital Signal Processing**

(Listed jointly with ESE 710.) Theory and applications of digital signal processing including discrete equivalence of continuous signals and systems; digital simulation and block diagram representation of computer programs; choice of state variables for efficient realization; quantization, roundoff, word length, and stability; choice of sampling rates; discrete Fourier transforms, high-speed convolution, and correlation; and digital filtering and modeling. Prerequisite: BMS 706.

**712-3 Biodynamics**

Includes the mechanical structure and function of biological systems and the interaction of the systems with external force and pressure environments.

**713-3 Advanced Biomechanics and Biofluids**

Application of solid and fluid mechanics and thermodynamics toward describing biological systems. Students review primary references in their selected areas. Prerequisite: BMS 850, 851.

**714-3 Advanced Engineering Biophysics**

Application of mathematical and engineering techniques toward describing biological systems. Students review primary references in their selected areas. Prerequisite: BMS 698, 850, 851; ESE 522.

**717-4 Advanced Bioinstrumentation**

Principles of design and analysis of electronic instrumentation for biological applications. Students review primary references in their selected areas. Completion of BMS core courses required.

**721-4 Biomedical Electronics**

(Listed jointly with BME 777.) Introduction to electronics for life scientists. Topics include AC/DC circuits, semiconductor and operational amplifier theory, digital devices and microprocessors, computer applications, biological transducers, and bioinstrumentation. 3 hours lecture, 2 hours lab.

**725-3 Introduction to Polymer Science I**

(Listed jointly with CHM 665.) Introduction to the structural and physical aspects of macromolecules; emphasis on the relationship of polymer structure to physical and mechanical properties. Prerequisite: CHM 213 or 561.

**726-3 Introduction to Polymer Science II**

(Listed jointly with CHM 666.) Step-growth and chain-growth polymerization in homogeneous and heterogeneous media; properties of commercial polymers. Prerequisite: CHM 213 or 561.

**727-1 to 2 Introduction to Polymer Science Laboratory I**

(Listed jointly with CHM 667.) Laboratory illustrations of BMS 725 lecture material and techniques of polymer science. Prerequisite: CHM 213 or 561.

**728-1 to 2 Introduction to Polymer Science Laboratory II**

(Listed jointly with CHM 668.) Laboratory illustrations of BMS 726 lecture material and techniques of polymer science. Prerequisite: CHM 213 or 561.

**733-3 Advanced Inorganic Chemistry I**

(Listed jointly with CHM 720.) Study of atomic structure, modern theories of chemical bonding, and structural concepts of inorganic chemistry and their relationships to reactivity, acids and bases in aqueous and nonaqueous systems, and energetics of reactions.

**734-4 Advanced Inorganic Chemistry II**

(Listed jointly with CHM 721.) Thorough examination of coordination chemistry of the metals stressing transition elements, crystal and ligand field approaches and molecular orbital theory as applied to organometallic systems, mechanisms of inorganic reactions, and the role of metal ions in biological systems. Prerequisite: BMS 733 or permission of instructor.

**735-3 Advanced Inorganic Chemistry III**

(Listed jointly with CHM 722.) Survey of the applications of physical methods in the examination and characterization of inorganic compounds. Emphasis is on methods applied to transition metal complexes. Prerequisite: BMS 734.

**736-3 Chemical Kinetics**

(Listed jointly with CHM 751.) Characterization of simple kinetic systems, experimental methods, energy distributions in molecules, the transition state method, and chain reactions in solution. Prerequisite: CHM 453 or equivalent, permission of instructor.

**737-3 Chemical Thermodynamics**

Fundamentals; first, second, and third laws; and application to solutions. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**738-3 Selected Topics in Physical Chemistry**

(Listed jointly with CHM 855.) Selected topics in the field of physical chemistry such as molecular spectroscopy, advanced molecular structure, magnetic resonance, X rays and crystal structure, statistical mechanics, or precise physical-chemical measurements.

**740-5 Advanced Bioanalytical Chemistry**

In-depth presentation of analytical, chemical, and biochemical techniques for determining pollutants, drugs, and toxins encountered in solving biomedical problems. Completion of BMS core courses required.



**750-4 to 10 Molecular Biology Lecture**

Basic course in the structural, chemical, and physiological properties of cells. Subject areas include the chemistry of biological systems, concepts of metabolism and bioenergetics, the organization of and transport through biological membranes, and the ultrastructure of cellular organelles.

**751-1 to 6 Biomedical Sciences Laboratory**

Illustrates major techniques used in the study of the chemistry of biological systems.

**752-4 to 10 Molecular Biology II**

Survey course emphasizing an experimental and problem-solving approach to amino acid metabolism, nucleic acid function, and hormones. Prerequisite: BMS 750 or permission of instructor.

**754-3 Molecular Biology of Learning and Memory**

Modern molecular biological investigations of the process of learning and memory. Implications for the development of a molecular theory of memory processes are considered. Prerequisite: BMS 752, 835; or equivalent.

**755-2 to 6 Cancer: Molecular Aspects**

(Listed jointly with BCH 755.) Profile of the general properties of transformed cells and an in-depth examination of the mechanisms of oncogenesis at the level of molecular genetics. Completion of BMS core courses and permission of instructor required.

**760-4 Magnetic Resonance in Living Systems**

(Listed jointly with BCH 760.) Nuclear magnetic resonance (NMR) is presented as a method of studying the metabolism and function of living systems at the molecular level. Specific applications to cells, tissues, animals, and people are considered. Prerequisite: BMS 750 and 752 or permission of instructor required.

**761-4 Magnetic Resonance Imaging**

(Listed jointly with BCH 761.) Magnetic resonance imaging (MRI) is presented as a noninvasive method for clinical diagnosis and biomedical research. Basic principles of MRI and specific applications of the techniques are considered. Prerequisite: BMS 760 or permission of instructor.

**767-3 Enzymes**

(Listed jointly with BCH 727.) Mechanism of enzyme catalysis, including such topics as structure, kinetics, energetics, allosterism, coenzymes, and control of enzymes and multienzyme systems. Prerequisite: BMS 752, 835; or equivalent.

**768-3 Biochemistry of Peptide Hormones**

(Listed jointly with BCH 729.) Synthesis, secretion, degradation, structure assay, mechanism of action, and function of peptide hormones are presented. Emphasis is on insulin and other hormones involved in diabetes mellitus. Prerequisite: BMS 752, 835; or equivalent.

**769-3 Biochemistry of Membranes**

(Listed jointly with BCH 731.) Examines the biochemistry of membranes and provides basic information on membrane composition and processes. Prerequisite: BMS 752, 835; or equivalent.

**770-3 Biological Macromolecules**

(Listed jointly with BCH 750.) Structure-function analysis of biological macromolecules (particularly proteins and polynucleotides) based on chemical and physical properties. Prerequisite: BMS 752, 835 or equivalent.

**771-2 Radioisotope Principles**

(Listed jointly with BCH 743.) Principles of  $\alpha$ ,  $\beta$ , and  $\gamma$  radiation and methodology of counting with application to physical and biological problems.

**772-4 Human Heritable Metabolic Diseases**

(Listed jointly with BCH 826.) Biochemical mechanisms of human inherited diseases and organ metabolism to genetic change and to physiological responses. Completion of BMS core courses required.

**773-3 Biochemical Regulation**

Regulatory mechanisms of gene expression, including enzyme synthesis and hormonal regulation. Prerequisite: BMS 752, 835; or equivalent.

**774-3 Biochemistry of Connective Tissue**

Chemistry and metabolism of fibrous proteins and glycosamino-glycans, and the functional significance of these extracellular substances. Completion of BMS core courses required.

**775-3 Photobiology**

(Listed jointly with BIO 728.) Topics vary. Prerequisite: BMS 752, 835; or equivalent.

**776-1 to 6 Bioenergetics**

(Listed jointly with BCH 726.) Structure of energy-transducing membranes of mitochondria, chloroplasts, and bacteria. Emphasis on mechanisms of energy transduction, thermodynamics of oxidation-reduction reactions, biophysical spectroscopic methods, and structure and surface topography of membrane proteins. Prerequisite: BMS 752.

**779-3 Molecular Genetics**

(Listed jointly with BIO 734.) Study of the replication, organization, and function of nucleic acids with emphasis on the role of nucleic acids in protein synthesis.



**780-4 Human Genetics**

(Listed jointly with BIO 626.) Nature of human genetic traits, methods of analysis of inheritance, principles of counseling, and therapy. Prerequisite: BMS 752, 835.

**785-2 Advanced Seminar in Genetics**

(Listed jointly with BIO 735.) Review of current literature in molecular or human genetics subjects. Presentation of reviews to other students. Prerequisite: BMS 780.

**786-3 Behavior Genetics**

(Listed jointly with BIO 738.) Behavior is considered as a population phenomenon and as an adaptive process. Evolutionary theory is used to integrate the disparate aspects of behavioral phenomena. Prerequisite: BMS 780.

**790-6 Recombinant DNA Methods**

(Listed jointly with BCH 736 and BIO 737.) Microbial and molecular techniques for producing, cloning, and characterizing recombinant DNA molecules; laboratory exercises in gene manipulation to give an understanding of principles of genetic engineering. Graded pass/unsatisfactory. Prerequisite: BMS 750, 752; BIO 654/BMS 791 and BIO 734/BMS 779; or permission of instructor.

**791-3 Microbial Genetics**

(Listed jointly with BIO 654 and M&I 654.) Basic concepts of production of microbial mutations, and their detection and analysis. The use of microbial genetics in elucidating cellular functions; the construction of plasmids and their use in genetic engineering. Prerequisite: BMS 752, 835; or equivalent.

**792-3 Microbial Genetics Laboratory**

(Listed jointly with BIO 656.) Familiarizes students with microbial genetics techniques. Prerequisite: BMS 791.

**793-5 Microbial Ecology**

(Listed jointly with BIO 625.) Microbes in soil, water, and air. Experiments on mineral cycles, physical and biological limiting factors, and symbiosis. Natural communities of microbes and microbes of special human environments. Includes field studies.

**795-4.5 Microbial Physiology**

Emphasizes the diverse biological and biochemical activities of microorganisms as they relate to cell structure and function. The relationship of nutrition, growth, environment, survival, and inhibitors to cell activity is related to current topics in microbiology.

**796-2 Microbial Physiology Laboratory**

Study of the physiological and biochemical processes unique to microorganisms. Prerequisite: BMS 795.

**799-2 Human Parasitology**

(Listed jointly with BIO 676.) Study of the medical aspects of parasitology such as pathology, symptomatology, diagnosis, and identification of parasites. Course content is divided into three major categories: human protozoology, helminthology, and anthropology.

**801-4 Principles of Host-Parasite Interaction**

(Listed jointly with M&I 822.) Study of infection and resistance, which may result in the production of infectious diseases. The effect of microbial virulence factors, mode of entry of microorganisms into the body, their spread through tissue, and the role of the host immune responses are studied. Prerequisite: BIO 402, M&I 726; or equivalent.

**802-5 Pathogenic Microbiology**

(Listed jointly with M&I 726.) Study of microorganisms pathogenic for humans and animals, and mechanisms of microbial pathogenesis. Emphasis on independent study. Prerequisite: BMS 752, 835; or equivalent.

**804-4 Medical Mycology**

Study of medically important fungi and their pathogenesis in humans and animals. Emphasis on proper isolation and identification procedures. Prerequisite: BMS 752, 835; or equivalent.

**807-3 Basic Virology**

(Listed jointly with M&I 731.) Introduction to the field of virology with emphasis on animal viruses. Studies the intrinsic properties of viruses and their interaction with cells; multiplication, disease production, genetics, and tumor induction. Completion of BMS core courses required.

**808-3 Molecular Virology**

(Listed jointly with M&I 831.) Structure, infectious process, replication, maturation, release, and genetics at the molecular level of the major groups of animal viruses. Prerequisite: BMS 752, 835.

**809-3 Viral Oncology**

(Listed jointly with M&I 833.) Understanding the process involved in cell transformation by oncogenic viruses. Prerequisite: BMS 752, 835.

**812-5 Immunobiology**

(Listed jointly with M&I 745.) Study of the biology of the immune system, as well as its function in health and disease. Specific diseases are used as models for immunologically mediated conditions. Prerequisite: BMS 752, 835; or equivalent.

**813-2 to 8 Special Topics in Immunology**

(Listed jointly with M&I 840.) Students select, present, and analyze information from the current literature in immunobiology. Prerequisite: BMS 752, 835.



**818-3 Infection and Immunity Seminar**

(Listed jointly with M&I 846.) Deals with the effects of microbial and metazoan parasites on both host resistance and immunologically mediated disease processes. Prerequisite: BMS 752, 835.

**834-6 Electron Microscopy for Life Sciences**

(Listed jointly with BIO 740.) Introduction to theoretical and practical aspects of transmission electron microscopy. Emphasis on interpretation and evaluation of electron micrographs. 3 hours lecture, 6 hours lab; additional lab time is required. Completion of a course in histology or cell biology required.

**835-4 to 10 Cell Biology**

(Listed jointly with BIO 720.) Interdisciplinary survey of cellular functions, including location of molecular events and functional compartmentation within the cell, recognition of structural and functional elements of the cell, and interaction of cells in specialized tissues.

**836-2 Cell Biology Laboratory**

Integration and application of the concepts of cell biology in the laboratory, including electron microscopy, nucleic acids, cytogenetics, membrane/organelle ultrastructure, epithelial/connective tissue, nerve-muscle, and *in vitro* culture laboratories. Prerequisite: BMS 701.

**837-8 Human Gross Anatomy**

(Listed jointly with ANT 711.) Lectures and dissection of human cadaver.

**838-6 Microanatomy**

Introduction to basic cell structure, including membranes, nucleus, and cytoplasmic organelles. Emphasis on the detailed histological anatomy of the four basic tissues, and major organs and systems of the body. Prerequisite: BMS 751, 752, 835.

**839-3 Developmental Biology**

(Listed jointly with BIO 603.) Describes underlying processes that initiate the development of tissue and whole organisms in plants and animals.

**840-2 Reproductive Anatomy and Physiology**

Reproductive cycles and gametogenesis; intercourse and conception; events of pregnancy and parturition; contraception, sterility, and dysfunction. Completion of BMS core courses required.

**842-3 Experimental Teratology**

Examination of development and the periods therein when the organism is most susceptible to physiological insult. Emphasis on birds and mammals. Completion of BMS core courses required.

**843-3 Experimental Teratology Laboratory**

Effects of experimental procedures and abnormal environments on the development of the avian and mammalian embryo. Completion of BMS core courses required. Corequisite: BMS 842.

**850-4 to 10 Biological Systems I**

Basic course in structure, function, and interactions of human organ systems. Subject areas include musculoskeletal, neurological, cardiovascular, and respiratory systems. Prerequisite: BMS 752, 835, or permission of instructor.

**851-4 to 10 Biological Systems II**

Basic course in structure, function, and interactions of human organ systems. Subject areas include endocrine, gastrointestinal, urinary, and reproductive systems. Prerequisite: BMS 850 or permission of instructor.

**852-5 Physiology and Biophysics of Cells and Systems I**

(Listed jointly with P&B 601.) Principles governing cellular steady state; biophysical basis of nervous system information; muscle contractility and excitation-contraction coupling; biophysical basis of heart excitation and contraction; cardiovascular physiology of the heart; and pulmonary physiology.

**853-4 Physiology and Biophysics of Cells and Systems II**

(Listed jointly with P&B 602.) Epithelial solute and water transport; the control of intracellular pH and its role in cellular growth; gastrointestinal mucosal transport; hormonal adaptation; muscle energetics and exercise. Prerequisite: BMS 852.

**855-3 Control Mechanisms of the Cardiovascular System**

(Listed jointly with P&B 732.) Autonomic nervous system's control of heart and vessels including cranial and spinal control, responses to stress, and pathology of the control system. Prerequisite: BMS 850, 851.

**856-3 Cardiac Dynamics**

Basic principles of cardiac function from the viewpoint of several disciplines. The heart is described as a muscle as well as a pump, with special reference to physiological, clinical, and mathematical considerations. Prerequisite: BMS 850, 851.

**857-3 Pulmonary Physiology**

(Listed jointly with P&B 741.) Survey of the respiratory system. Main aspects covered include functional anatomy, pulmonary ventilation, mechanics of respiration, pulmonary circulation, gas exchange and transport in the blood, ventilation/perfusion relationships, and control of ventilation. Prerequisite: BMS 850, 851; or permission of instructor.



**858-3 Renal Function**

In-depth study of the mechanisms of renal function with emphasis on the regulation of water and electrolyte excretion in mammals. Prerequisite: BMS 850, 851.

**859-3 Gastrointestinal Physiology**

(Listed jointly with P&B 761.) Survey of gastrointestinal physiology emphasizing integrative mechanisms of motility, secretion, and absorption. Prerequisite: BMS 850, 851.

**860-3 General Endocrinology**

(Listed jointly with P&B 771.) Survey of endocrinological mechanisms and their role in integration of body function. Prerequisite: BMS 850, 851.

**861-2 General Endocrinology Laboratory**

Exercises reinforce principles described in BMS 860. Prerequisite: BMS 860.

**862-3 Physiological Control Mechanisms**

Integrative course in physiology emphasizing applications of control theory. Prerequisite: BMS 850, 851.

**863-1 Physiological Control Mechanisms Laboratory**

Exercises reinforce principles described in BMS 862. Prerequisite: BMS 862.

**864-5 Physiological Aspects of Exercise**

(Listed jointly with P&B 783.) Integration of physiological mechanisms involved in exercise. Cellular, neuromuscular, cardiovascular, and respiratory changes are discussed with relationship to exercise performance.

**879-2 to 6 General Pharmacology I**

(Listed jointly with PHA 879.) Introduces students to drug-receptor interactions, dose-response relationships, physiochemical principles of drug action and distribution, pharmacokinetics, mechanisms of action, and uses of drugs affecting both autonomic and central nervous system functions. Completion of BMS core courses or equivalent required.

**880-4 General Pharmacology II**

(Listed jointly with PHA 880.) Extends the principles and theoretical considerations learned in BMS 879 and applies them to the action of drugs on the cardiovascular, respiratory, endocrine, gastrointestinal, and genito-urinary systems. Emphasis on antibiotics, chemotherapy of infectious diseases, antineoplasia, and immunosuppressants. An introduction to toxicology is provided. Prerequisite: BMS 879.

**885-3 Principles of Drug Action**

Introduces the science of pharmacology/toxicology in terms of general concepts and principles governing chemical-biological interactions. Completion of courses in molecular biology, physiology and biophysics, and radio isotopes required.

**886-6 General Pathology**

Introduces basic principles of abnormal biological processes in the human and subhuman vertebrate organisms. Deals with tissue injury and degeneration, abnormal growth, infection and host defense, selected metabolic and congenital disorders, and forensic problems. Complies with the Toxicology Society's recommended requirements for the professional toxicologist. Completion of BMS core courses, anatomy sequence, or equivalent required.

**887-4 General Toxicology I**

(Listed jointly with PHA 751.) Introduction to general toxicology covering the principles of intoxication and detoxication, classification of poisons, exposure characteristics, biotransformation and biokinetics of poisons, systemic toxicology including CNS, splanchnic organs, cardiovascular, hematopoietic, respiratory, reproductive, and skeletal systems. Prerequisite: BMS 879, 880.

**888-4 General Toxicology II**

(Listed jointly with PHA 752.) Introduction to general toxicology. Particular toxic agents are studied, including teratogens, mutagens, oncogens, heavy metals, and other environmental contaminants and toxins. Clinical, forensic, industrial, and agricultural toxicology are addressed along with regulations that apply to the field. Prerequisite: BMS 887.

**889-3 Toxicology Pathology**

Pathobiology of toxic chemicals and materials is presented with emphasis on anatomic and physiologic changes produced in common laboratory animal species. Research methods enhancing the pathologic evaluation of biomedical specimens are stressed. Prerequisite: BMS 886.

**890-3 Biotransformation and Kinetics**

(Listed jointly with PHA 750.) Covers the general basis of toxicology and therapeutics; pharmacokinetics, xenobiotic metabolism, and their effects on determination of the dose-response-time relationship. Completion of BMS core courses or equivalent required.

**893-4 Methods in Environmental Toxicology**

(Listed jointly with BIO 618.) A study of methods used to study toxic effects of chemical and physical agents on living organisms. Emphasis on those agents that affect populations and communities within natural ecosystems, but can be used to indicate potential toxicity for humans. 6 hours lab, 1 hour recitation. Prerequisite: BMS 887, BIO 615, 616, or PHA 751.



**898-3 Neuropharmacology**

In-depth treatment of the anatomy, biochemistry, and physiology of the nervous system and the effect of drugs on the nervous system. Completion of BMS core courses or equivalent required.

**902-3 Neurophysiology**

(Listed jointly with P&B 720.) Survey of neurophysiology with emphasis on somatic and autonomic control of body function. Completion of BMS core courses required.

**903-5 Human Neuroanatomy**

(Listed jointly with ANT 731.) Detailed survey of the anatomy and physiology of the major fiber tracts and cell groups of the human central nervous system. Completion of BMS core courses required.

**904-3 Cellular Neuroanatomy**

(Listed jointly with ANT 732.) Correlated structure, chemistry, and physiology of vertebrate neurons, neuroglia, and synapses under normal conditions and during development, degeneration, and regeneration. Completion of BMS core courses required.

**905-4 Information Processing**

(Listed jointly with PSY 665.) Survey of experimental findings in animal and human memory with emphasis on their implications for current theories of memory. Completion of BMS core courses required.

**909-4 Sensory Processes**

(Listed jointly with PSY 773.) Survey of the physiology and psychology of the senses. Emphasis on receptor mechanisms and neural encoding processes. Completion of BMS core courses required.

**911-4 Neuropsychology/Neuroethology**

Survey of biological bases of motivation and emotion, learning and memory, and cognition and language. Completion of BMS core courses or equivalent required.

**912-4 Experimental Methods in Neuroscience**

Survey of current experimental methods in neuroscience, with emphasis on electrical recording techniques and chemical and electrical stimulation. Completion of BMS core courses or equivalent required.

**913-4 Fundamentals of Human Neurobiology**

(Listed jointly with ANT 691.) Development, structure, and function of the human nervous system as it relates to neuropathology, clinical neurology, and behavioral science. Completion of general biology and/or general psychology courses, and permission of instructor required.

**931-3 Protein and Vitamin Nutrition**

(Listed jointly with BCH 771.) Examination of the utilization and function of proteins, amino acids, and vitamins in the nutrition of the organism. Reference is made to microbial systems; emphasis on these processes as they occur in birds and mammals. Completion of BMS core courses required.

**990-1 to 3 Biomedical Sciences Seminar**

Convention of student body and faculty in biomedical sciences to learn, discuss, and critique the basic and clinical biomedical literature as presented by an active and reputable scientific investigator. Student presentations required.

**991-1 to 15 Special Topics in Biomedical Sciences**

Selected topics in biomedical sciences.

**994-1 to 6 Introduction to Research**

Introduces BMS students to the ongoing research activities within the five program tracks; involves presentations by BMS faculty. Graded pass/unsatisfactory.

**995-1 to 15 Nondissertation Research**

Supervised research other than laboratory rotations or dissertation research.

**996-1 to 15 Laboratory Rotation I**

Independent study designed to develop proficiency in technology, instrumentation, research design, and data analysis in an area of concentration (advanced curriculum) different from a student's area of specialization.

**997-1 to 15 Laboratory Rotation II**

Independent study designed to develop proficiency in technology, instrumentation, research design, and data analysis in an area of concentration (advanced curriculum) different from a student's area of specialization.

**998-1 to 15 Laboratory Rotation III**

Independent study designed to develop proficiency in technology, instrumentation, research design, and data analysis in an area of concentration (advanced curriculum) different from a student's area of specialization.

**999-1 to 15 Dissertation Research**

Planning and execution of scholarly original research of a quality that is publishable in a referred, scientific journal. Research must be communicated to the supervisory committee in written form and defended by public, oral examination.



**Chemistry/CHM**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**511-7.5 Qualitative Organic Analysis**

Systematic classification and identification of organic compounds by chemical and instrumental methods. 3 hours lecture, 9 hours lab. Prerequisite: CHM 213, 217.

**512-3 Quantitative Analysis**

Introduction to chemical methods of analysis covering traditional as well as modern techniques and equipment; emphasis on calculations and interpretation of analytical data. Prerequisite: CHM 141. Corequisite: CHM 514.

**513-3 Instrumental Analysis**

Introduction to the theory and practice of modern chemical instrumentation. Topics include elementary electronics, spectrophotometry, atomic absorption, electrochemical techniques, chromatography, and other instrumental techniques. Prerequisite: CHM 452, 512. Corequisite: CHM 515.

**514-4.5 Quantitative Analysis Laboratory**

Experimental methods of analysis. Practical applications of the lecture material presented in CHM 512. Prerequisite: CHM 141. Corequisite: CHM 512.

**515-4.5 Instrumental Analysis Laboratory**

Introduction to experimental instrumental analysis. Practical experience in the operation of chemical instrumentation; emphasizes applications of the material presented in CHM 513. Prerequisite: CHM 452, 512. Corequisite: CHM 513.

**520-3, 521-3 Advanced Inorganic Chemistry**

Principles and concepts of inorganic chemistry, including the periodic table, atomic structure, bonding, coordination compounds, and an introduction to group theory. Prerequisite: CHM 453 or permission of instructor.

**551-3, 552-3, 553-3 Physical Chemistry**

Theoretical aspects of chemistry including thermodynamics, chemical kinetics, molecular structure and spectra, and the structure of solids and liquids. Prerequisite: CHM 141, PHY 242, or permission of instructor.

**556-4 Physical Chemistry for Nonchemists**

Introduction for nonchemistry majors to the ideas of physical chemistry, including thermodynamics, properties of liquids and solids, solution properties, and kinetics. Completion of one year each of college chemistry and physics and two quarters of calculus required.

**557-2 Physical Chemistry Laboratory I**

Experimental methods of physical chemistry. Corequisite: CHM 552.

**558-2 Physical Chemistry Laboratory II**

Experimental methods of physical chemistry. Corequisite: CHM 553.

**561-4 The Organic Chemistry of Engineering Materials**

Molecular structure, stereochemistry, properties, and reactivities of selected organic substances of industrial importance including fuels, lubricants, solvents, coatings, plastics, dyes, and naturally occurring engineering materials. Prerequisite: CHM 122.

**588-1 to 3 Independent Reading****599-1 to 5 Special Problems in Chemistry****610-3.5 Environmental Chemistry I: Air**

Study of the earth's atmosphere including its normal composition and atmospheric reactions with emphasis on the nature, causes, effects, detection, and abatement of various types of air pollution. Includes classroom, laboratory, and field training in the principles and practice of monitoring for the common atmospheric pollutants. 2 hours lecture, 3 hours lab or field project. Prerequisite: CHM 213, 312; or corequisite CHM 614.

**611-3.5 Environmental Chemistry II: Water**

Comprehensive introduction to the chemistry of natural waters and waste waters and the chemical transformations that occur in these systems. Emphasis on the analytical techniques commonly used to determine water quality. No previous technical knowledge of water chemistry is required, although more experienced personnel should also benefit from the course. 2 hours lecture, 3 hours lab or field project. Prerequisite: CHM 213, 312; or corequisite CHM 615.

**612-3.5 Environmental Chemistry III: Solids**

Study of the problems of solid wastes, pesticides, food additives, and radioactive materials including their chemical composition, effects, detection, disposal, and natural breakdown. 2 hours lecture, 3 hours lab or field project. Prerequisite: CHM 213, 312; or corequisite CHM 616.

**614-1, 615-1, 616-1 Directed Study in Prerequisite Material for Environmental Chemistry I, II, and III**

Survey of topics in organic and analytical chemistry for students in CHM 610, 611, and 612 respectively, who do not have previous course work in these two areas of chemistry. The structure and reactions of related compounds and principles of some analytical techniques are briefly covered each week prior to their inclusion in the concurrent environmental chemistry course. Not open to students with credit for CHM 213 and 312 or equivalent. Prerequisite: CHM 122. Corequisite: for 614, CHM 610; for 615, CHM 611; for 616, CHM 612.



**625-3 Inorganic Preparations**

Preparation of representative inorganic compounds. Prerequisite: CHM 421.

**640-3, 641-3 Synthetic Medicinal Chemistry I, II**

Various chemical aspects of drugs including the synthetic design, mode of action, and uses of various pharmaceuticals. Topics include cardiovascular agents, antibiotics, antitumor agents, and central nervous system drugs. Prerequisite: CHM 213.

**643-3, 644-3 Chemical Toxicology I, II**

Study of the basic principles of chemical toxicology. Chemicals that have the greatest incidence of abuse are discussed in more detail with regard to their chemical-biological interactions, symptomatology of toxicity, clinical chemistry tests, and treatment. Prerequisite: CHM 213, 312.

**646-3, 647-3 Clinical Chemistry I, II**

Study of the basic principles of the chemistry of blood and urine. Analytical procedures and clinical significance of the various test procedures are discussed with regard to aiding diagnosis of disease states. Prerequisite: CHM 213, 312.

**665-3 Introduction to Polymer Science I**

(Listed jointly with BMS 725.) Introduction to the structural and physical aspects of macromolecules; emphasis on the relationship of polymer structure to physical and mechanical properties. Prerequisite: CHM 213 or 561. Corequisite: CHM 667.

**666-3 Introduction to Polymer Science II**

(Listed jointly with BMS 726.) Step-growth and chain-growth polymerization in homogeneous and heterogeneous media; properties of commercial polymers. Prerequisite: CHM 213 or 561. Corequisite: CHM 668.

**667-1 to 2 Introduction to Polymer Science Laboratory I**

(Listed jointly with BMS 727.) Laboratory illustrations of CHM 665 lecture material and techniques of polymer science. Corequisite: CHM 665.

**668-1 to 2 Introduction to Polymer Science Laboratory II**

(Listed jointly with BMS 728.) Laboratory illustrations of CHM 666 lecture material and techniques of polymer science. Corequisite: CHM 666.

**669-4 Engineering Plastics: Materials, Processes, and Design**

(Listed jointly with MSE 689.) Properties and manufacturing processes of engineering plastics and the effect of these factors on plastics design. Illustrative laboratory projects are included. 2 hours lecture, 4 hours lab. Prerequisite: CHM 665.

**671-4.5, 672-4.5 Crystal Structure Analysis I, II**

Advanced methods of crystal analysis including X-ray, electron, and neutron diffraction as tools for determination of crystal structures followed by familiarization with basic crystallographic computations. 3 hours lecture, 3 hours lab.

**679-4 Materials Corrosion**

(Listed jointly with MSE 679.) Survey of the principles of corrosion processes with application to metallic and nonmetallic materials. Principles of electrochemistry are included. Prerequisite: MSE 315, 370; or corequisite CHM 453; or permission of instructor.

**700-3 Principles of Instruction in Chemistry**

Survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For chemistry majors only.

**720-3 Advanced Inorganic Chemistry I**

(Listed jointly with BMS 733.) Study of the modern theories of valence, structural inorganic chemistry, and the chemistry of nonmetals. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**721-3 Advanced Inorganic Chemistry II**

(Listed jointly with BMS 734.) Thorough examination of the chemistry of metals stressing the transition elements, ligand field theory, and mechanisms of inorganic reactions. Prerequisite: CHM 720 or equivalent, or permission of instructor.

**722-3 Advanced Inorganic Chemistry III**

(Listed jointly with BMS 735.) Survey of the applications of physical methods in the examination of inorganic compounds. Prerequisite: CHM 721 or equivalent, or permission of instructor.

**725-3 Inorganic Preparations**

Laboratory course demonstrating the techniques of preparation, separation, and characterization of representative inorganic compounds. Prerequisite: CHM 421 or equivalent, or permission of instructor.

**728-3 Photobiology**

Selected topics in photobiology. Prerequisite: BCH 421 (621), 423 (623), or permission of instructor.

**730-3 Instrumentation**

Introduction to the theory and practice of modern chemical instrumentation; elementary electronics, spectrophotometry, atomic absorption, electrochemical techniques, chromatography, and other instrumental techniques. Prerequisite: CHM 453, 512 or equivalent; or permission of instructor.



**732-4.5 Instrumentation Laboratory**

Introduction to experimental instrumental analysis; practical experience in the operation of chemical instrumentation; emphasizes application of material in CHM 730. Prerequisite: CHM 453, 512 or equivalent; or permission of instructor. Corequisite: CHM 730.

**735-3 Selected Topics in Analytical Chemistry**

A selected topic in the field of analytical chemistry such as chromatography, electroanalytical chemistry such as trace analysis, bioanalytical chemistry, advanced instrumental analysis, analytical spectroscopy, or separation methodology.

**740-3 Elements of Organic Reactions**

Discussion of the more important organic reactions including their scope, limitations, and mechanisms. Prerequisite: CHM 213 or equivalent, or permission of instructor.

**741-3 Synthetic Organic Reactions**

Systematic treatment of organic reactions including, where applicable, some theoretical basis for the nature of the reaction. Emphasis on the uses of these reactions in organic synthesis. Prerequisite: CHM 740 or equivalent, or permission of instructor.

**742-3 Structural Concepts in Organic Chemistry**

Study of molecular orbital theory, reactive species, theories of acids and bases, and an introduction to stereochemistry. Prerequisite: CHM 741 or equivalent, or permission of instructor.

**745-3 Organic Preparations**

Advanced laboratory course in the synthesis, isolation, and characterization of organic compounds with emphasis on recent advances and techniques. Prerequisite: CHM 213 or equivalent, or permission of instructor.

**750-3 Introduction to Quantum Chemistry**

Introduction to the ideas and mathematical techniques of quantum theory, including applications to some simple chemical systems. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**751-3 Chemical Kinetics**

(Listed jointly with BMS 736.) Characterization of simple kinetic systems, experimental methods, energy distributions in molecules, the transition state method, and chain reactions in solution. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**752-3 Thermodynamics**

Chemical thermodynamics, fundamentals; first, second, and third laws; applications to solutions. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**760-3 Chemical Equilibrium and Chemical Measurement**

In-depth treatment of ionic equilibria. Topics include pertinent mathematical operations used in equilibrium calculations. Chemical systems discussed include strong and weak acids and bases, polyprotic and monoprotic acids and bases, precipitation complex formation, and oxidation-reduction equilibria. Prerequisite: CHM 512, 514; or permission of instructor.

**761-3 Advanced Analytical Chemistry**

Survey of the more popular and useful modern analytical methods. Topics include separation techniques, selective ion electrodes, spectroscopy, electrochemistry, mathematical techniques of data optimization, methods of sample preparation, precipitate formation, and organic analytical reagents. Prerequisite: CHM 513 or permission of instructor.

**800-0 to 1 Seminar**

Weekly discussions of recent topics and problems in chemistry.

**820-3 Radiochemistry**

Nuclear structure, radioactivity, nuclear reactions, and the application of radioactive isotopes to chemical problems. Prerequisite: CHM 453 or equivalent, or permission of instructor.

**825-3 Selected Topics in Inorganic Chemistry**

A selected topic in the field of inorganic chemistry, such as the reactions of substances in nonaqueous solvents, metal chelate compounds, inorganic reaction mechanisms, ligand field theory, or the chemistry of the lanthanides and actinides.

**830-3 Nuclear and Electron Magnetic Resonance Spectroscopy**

Examination of the theories and practices of NMR and EPR including examples of their applications to structural and kinetic studies of both organic and inorganic molecules.

**840-3 Theoretical Organic Chemistry**

Advanced treatment of the influence of structure on the properties of organic molecules. Prerequisite: CHM 740 or equivalent, or permission of instructor.

**841-3 Stereochemistry**

Detailed study of the geometries of organic compounds, with emphasis on the classification and reactions of optical and conformational isomers. Prerequisite: CHM 740 or equivalent, or permission of instructor.

**842-3 Organic Chemistry of High Polymers**

The chemistry and properties of high polymers including the organic chemistry of their preparation and the kinetics of polymerization. Prerequisite: CHM 740 or equivalent, or permission of instructor.



**845-3 Selected Topics in Organic Chemistry**

A selected topic in the field of organic chemistry, such as organic spectroscopy, heterocyclic chemistry, organometallic chemistry, and the chemistry of natural products.

**850-3 Quantum Chemistry**

Principles and applications of quantum theory to chemical problems. Electronic structure of molecules and its correlation with the chemical and physical properties of substances. Prerequisite: CHM 750 or equivalent, or permission of instructor.

**851-3 Statistical Thermodynamics**

Definition of partition function; translational, rotational, vibrational, and electronic partition functions and their calculation and application to thermodynamic problems. Calculation of thermodynamic functions from spectroscopic information. Prerequisite: CHM 752 or equivalent, or permission of instructor.

**852-3 Theory of Solutions**

Survey of modern theories of solutions and the liquid state. Prerequisite: CHM 752.

**853-3 Group Theory**

Introduction to group theory stressing its application in the areas of hybridization schemes, molecular orbitals, ligand field theory, and spectroscopy. Prerequisite: CHM 750 or equivalent, or permission of instructor.

**855-3 Selected Topics in Physical Chemistry**

(Listed jointly with BMS 738.) A selected topic in the field of physical chemistry such as molecular spectroscopy, advanced molecular structure, magnetic resonance, X rays, crystal structure, statistical mechanics, and precision physical-chemical measurements.

**899-1 to 18 Research**

Research for the thesis.

**Classics/CLS**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**530-4 Studies in Ancient Literature**

Course offers a variety of topics including drama, epic, and lyric poetry; prose; selected themes in ancient literature; and literary criticism. (Previously listed as CLS 510.)

**540-4 Studies in Ancient Art and Archaeology**

(Listed jointly with ART 611.) Greece in the Bronze Age; classical Greece and Rome; and selected areas of Greek and Roman art and archaeology.

**550-4 Studies in Ancient Culture and Society**

Greek and Roman civilization with evidence from art, literature, archaeology, law, and other sources.

**560-4 Studies in Ancient Mythology**

Greek and Roman mythology; aspects and approaches to the study of myth; archaeological and nonliterary sources. (Previously listed as CLS 520.)

**570-4 Studies in Law, Government, and Politics**

Political problems of the ancient world; law and legal systems; and government and administration. (Previously listed as CLS 530.)

**Communication/COM**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**611-4 Performance for the Media**

Development of skills necessary for effective television and radio presentations. Study of criteria for selecting appropriate talent, and frequent practice in a wide range of media settings. Prerequisite: COM 111, 251, or permission of instructor.

**621-4 Language Development**

Development of speech and language in the preschool years.

**629-4 Urban Communications Theory**

(Listed jointly with PLS 629.) Processes and institutions by which individuals and groups communicate in an urban environment. Model of an urban communication system developed by interdisciplinary systems approach.

**632-4 Female/Male Communication**

Comparison and contrast of the communicative modes of women and men with a study of how to improve these transactions.

**639-4 Freedom of Speech**

Study of the growth and development of free speech in the United States. Emphasis on the development of definitions of free speech and various communication strategies in different settings.

**641-4 Advanced Interpersonal Communication**

In-depth view of interpersonal communication skills: presenting, receiving, and challenging. A group context is used to promote self-directed changes in interpersonal style. Prerequisite: COM 102 or 203, or permission of instructor.

**643-4 Interviewing**

Through a matrix organizational structure, students experience theory in selection, survey, journalistic, performance appraisal, persuasion, and counseling interviewing situations. Prerequisite: COM 203 or permission of instructor.



**645-4 Conference Leadership**

Simulation that focuses on the creation, development, and execution of a professional conference through assessment of participants' needs. Experiences include completing group tasks through assigned roles developed from current leadership theories. Prerequisite: COM 203 or permission of instructor.

**647-4 Organizational Communication**

Simulation that focuses on the creation of an organizational product, philosophy, and environment within a designated organizational structure. Experiences include development of communication channels, networks, roles, and climate, based on current communication theory. Prerequisite: COM 203 or permission of instructor.

**649-4 Survey of Communication Research**

Provides a basic knowledge of the behavioral approach and of the current theories and experiments being conducted in communication research.

**651-4 Communication Consulting and Training**

By means of a matrix structure, consulting and training theories are experienced in communication programs and processes as a methodology for human resource development. Prerequisite: COM 203, 447, or permission of instructor.

**653-4 Communication and Conflict**

In-depth study of the function of communication in conflict/crisis situations. Emphasis on the role that communication performs in conflict resolution in intrapersonal, interpersonal, group, and international situations.

**654-4 Feature Story Writing**

(Listed jointly with ENG 654.) Includes finding, writing, polishing, and marketing feature material.

**655-4 Nonverbal Communication**

Theory, survey of research, and experimental learning in nonverbal communication. Exploration of types and forms and of methods of sending and receiving nonverbal communication.

**657-4 Intercultural Communication**

Study of communication in intercultural environments. Emphasis on research and theory to better understand the complexity of intercultural communication interactions.

**658-4 Editing for the Media**

(Listed jointly with ENG 658.) Editing of copy for mass media with emphasis on newspaper format, headline writing, rewriting, and general copy desk.

**662-4 Mass Media Law and Regulation**

Includes the study of laws and regulations affecting mass media.

**664-4 Broadcast Criticism**

Analysis of contemporary programming and production practices including the development of critical standards for evaluation.

**671-4 Topics in Communication**

Examination of special topics in the various areas of speech communication. Titles vary.

**689-4 Communicating with the Elderly**

Analysis of the unique communication behaviors of the elderly and the physical, social, and emotional changes that cause these behaviors. Development of interpersonal, interviewing, and reporting skills by direct interaction with this age group. 3 hours lecture, 1 hour off-campus interviewing.

**691-1 Communication Techniques and Evaluation**

Philosophy and techniques of conducting communication events. Includes the planning, initiating, and summarizing of communication activities, and evaluating written and oral performance.

**741-4 Principles and Application of Communication Theory**

Examines communication theory relevant to the role of the communication specialist. Special consideration given to the changing pattern of communication roles and the application of communication theory to the problems of the utilization specialist. Also focuses on the possible consequences of the diffusion of communication innovations within the business, educational, and governmental institutions of American society.

**781-1 to 4 Independent Research**

Supervised independent research on a specific subject.

**Community Medicine/CME**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**601-3 Biostatistics I**

Presents basic statistical measures with emphasis on biomedical problems. Includes sampling techniques, making valid inferences and estimations, and testing hypotheses. Practice in use of calculations and preparation of data for machine analysis.

**602-3 Biostatistics II**

Studies advanced statistical methods for analysis of variance, multiple regression, survey methods, design of experimental investigations, vital statistics, bioassays, and sequential analysis. Prerequisite: CME 601.



**621-3 Epidemiology I**

Nature of epidemiological studies; descriptive epidemiology; experimental and observational investigations; cross-sections; prospective and retrospective studies; mortality and morbidity measurements and factors affecting comparison; life tables; and introduction to demographic measurements.

**622-3 Epidemiology II**

Advanced techniques of epidemiological investigation. Epidemiology of specific chronic diseases such as cancer, diabetes, and cardiovascular and mental disorders. Introduction to environmental and occupational epidemiology. Students prepare research protocol on a given specific problem. Prerequisite: CME 621.

**641-3 Environmental Medicine I**

Interaction of humans with special environments. Section one is an intensive study of respiration, the cardiovascular system, and the physics and physiology of gaseous environments.

**642-3 Environmental Medicine II**

Interaction of humans with special environments. Section two covers mineral, chemical, and drug metabolism; function of sensory systems; and the physics and physiological stresses of heat and cold, sound, and electromagnetic and ionizing radiation.

**643-3 Environmental Medicine III**

Interaction of humans with special environments. Section three studies effects of dynamic forces, biomechanics of the body, physiology of physical exercises, and engineering machines to improve human performance.

**650-3 Aerospace Medicine Industrial Hygiene Principles**

Surveys the history of aerospace medicine; outlines the role of the specialty as practiced in government agencies, aerospace industries, the airlines, and general aviation. Covers the current and future status of the specialty.

**651-2 Aerospace Medicine I**

General review, discussions of research projects, guest presentations, and selected advanced topics dealing with aerospace medicine, occupational medicine, and public health. Presentation and discussion of problem clinical cases related to aerospace medicine.

**652-2 Aerospace Medicine II**

Covers civil pilot medical case histories including presentation of the medical condition that the pilot experienced, the implications by medical certification, and the proper steps in denying or certifying the pilot. M.D. degree required. May be taken for letter grade or pass/unsatisfactory. Prerequisite: CME 651.

**653-3 Clinical Aerospace Medicine and Physiological Training**

Principles of physical examination and diagnosis are applied to selection and health maintenance of the flyer. Includes familiarization with flight environments and aerospace ground activities. Physiological training/altitude indoctrination are also incorporated.

**655-3 Introduction to Hyperbaric Medicine**

Mechanisms of hyperbaric oxygen therapy, equipment, safety considerations, and limitations. Conditions particularly amenable to this therapy are explored: decompression sickness, air embolism, gas gangrene, CO poisoning, and elective indications. May be taken for letter grade of pass/unsatisfactory.

**671-3 Principles of Occupational Health**

Presents the medical department in industry: its role, functions, administration, physical facilities, personnel, equipment, records, costs, benefits, intramural relationships and extramural relationships with professional societies, official agencies, organized labor, and paramedical occupations. M.D. or O.D. degree required.

**672-3 Clinical Occupational Health**

Principles of physical examination and diagnosis are applied to selection, placement, and return to work of industrial employees. Surveys of a variety of work environments are conducted with emphasis on potential health hazards. Course includes field experience. M.D. or O.D. required.

**701-3 Special Topics in Community Medicine (Aerospace)**

Provides the philosophy underlying each major aerospace medicine standard. It also explores the aerospace medical factors that convert safe flight into hazardous flight. M.D. degree and departmental approval required.

**731-3 to 5 Health Services Administration**

(Listed jointly with MGT 755 and EC 755.)

Overview of total health care system including public and private institutions and agencies, federal and state regulations, and methods of financing. Directed study of major contemporary forces affecting the health care delivery system. Class includes seminars and on-site experiences. Prerequisite: MGT 621.

**899-3 Aerospace Medical Research**

Under supervision of an adviser, students choose research problems, prepare bibliographical searches, plan experimental protocol, and conduct experimentation. A full report, constituting a thesis, is written and defended before a graduate committee.



## Computer Engineering/CEG

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 520-4 *Computer Organization and Assembly Language Programming*

Terminology and understanding of functional organizations and sequential operation of a digital computer. Program structure, and machine and assembly language topics including addressing, stacks, argument passing, arithmetic operations, traps, and input/output. Macros, modularization, linkers, and debuggers are used. 3 hours lecture, 2 hours lab. Prerequisite: CEG 260, CS 146.

### 560-4 *Digital System Design*

(Listed jointly with ESE 651.) Design of digital systems. Topics include flip-flops, timers, registers, digital arithmetic, register-level design, memory devices and their logic, controller and processor design, computer logic design, and microcomputer system design. Students must show competency in the design of digital systems. 3 hours lecture, 2 hours lab. Prerequisite: CEG 260.

### 591-4 *Introduction to Data Communications*

Principles of digital communication are discussed from a conceptual point of view with an elementary survey of theoretical aspects. Trends are analyzed in the context of competing technologies, changing needs, and emerging new technologies. 3 hours lecture, 2 hours lab. May be taken for letter grade or pass/unsatisfactory.

### 592-4 *Use of Microprocessors*

Introduction to the design and development of software and computer interfacing hardware for effective use of microprocessors in process control, data collecting, and other special purpose computing systems. Software topic loaders, assembly language programming, input/output, interrupts, and timing problems. 3 hours lecture, 2 hours lab. May be taken for letter grade or pass/unsatisfactory.

### 602-4 *Introduction to Computer Communication Design*

Survey of modern digital communications techniques. Specific focus is on serial transmission over public communication channels. Topics include information content and coding, asynchronous and synchronous formats, concentrating and multiplexing, channel properties, modulation techniques, common carrier services, error sources and control, regulatory policies, networks, and their analyses. Students design both hardware and software components of computer communications systems. 3 hours lecture, 2 hours lab. Knowledge of a higher order language required. Prerequisite: CEG 560.

### 611-4 *Microprocessor-Based System Design*

Introduces the design and development of software and computer interfacing hardware for effective use of microprocessors in process control, data collecting, and other special purpose computing systems. Software topics include assembly language programming, input/output, interrupts, direct memory access, and timing problems. 3 hours lecture, 2 hours lab. Prerequisite: ESE 551 or CEG 260, and ESE 520 or equivalent.

### 621-4 *Microcomputer Design Projects*

In-depth study of the design and use of microcomputer systems. The computer organization and interface facilities are examined. Hardware/software projects are required to develop techniques for hardware and software design of open-ended projects. 3 hours lecture, 2 hours lab. Prerequisite: CEG 520, 560.

### 633-4 *Operating Systems*

The role of resource allocation in general computer systems. The problems, techniques, and concepts that arise in multiaccess, multiprogram, and multiprocess systems are emphasized. Students must show ability to apply the concepts to the design of operating systems. 3 hours lecture, 2 hours lab. Prerequisite: CS 600, CEG 520. (Previously listed as CS 633.)

### 634-4 *Concurrent Software Design*

Concurrent programming: concurrency, processes, and synchronization. Unix System V is used to provide a framework for concurrent processes. Network connections to other processes. Network connections to other devices are used for real-time applications. Prerequisite: CEG 633.

### 653-4 *Design of Computing Systems*

Projects in the laboratory that combine engineering hardware and computer science software concepts in the design and implementation of small special-purpose computer systems. 3 hours lecture, 2 hours lab. Prerequisite: CEG 520, 560.

### 654-4 *VLSI Design*

(Listed jointly with ESE 654.) Introduction to VLSI system design. Topics include NMOS devices and circuit design techniques, basic building blocks for NMOS design, fabrication processing and design rules, chip planning and layout, system timing and power dissipation, simulation for VLSI design, and signal processing with VLSI. Prerequisite: CEG 560, ESE 641.



**656-4 Introduction to Robotics**

(Listed jointly with ESE 656 and MSE 656.) Introduction to the mathematics, programming, and control of robots. Topics presented include coordinate systems and transformations, kinematic equations, trajectory planning, dynamics, control, programming, and computer vision. Prerequisite: MTH 233.

**660-4 Introduction to Software Engineering**

Concepts of software engineering including analysis, design, and implementation of software engineering concepts that comprise structured programming and design. Case studies serve as examples illustrating the software life-cycle model. Prerequisite: CS 600 and 680 or 340.

**676-4 Computer Graphics**

Principles of computer graphics: representation of two- and three-dimensional space on a display. Data compression. Hidden surface problems: displays, input, graphic software packages, real-time applications. Students must show ability to apply the concepts in the design of graphics software. 3 hours lecture, 2 hours lab. Prerequisite: CS 600, MTH 253.

**677-4 Computer Graphics II**

Covers selected topics in detail, including hidden line and surface removal, shading models, curved surface generation, and color models. Students are expected to understand and implement sophisticated algorithms in these areas. Projects are individualized and creative. Selected papers are used for in-depth material. Emphasis is on the design of graphics systems. 3 hours lecture, 2 hours lab. Prerequisite: CEG 676.

**699-1 to 5 Selected Topics**

Selected topics in computer engineering. Topics vary. May be taken for letter grade or pass/unsatisfactory.

**700-3 Principles of Instruction in Computer Engineering**

Survey of available instructional materials and discussions of educational theory and techniques leading to more effective instruction. For graduate teaching assistants only.

**720-4 Computer Architecture**

Study of constructing highly specific and individual computers from basic building blocks such as memories, arithmetic units, and busses. Topics are stack mechanism, parallel computers, pipeline processing, processors based on programming languages, multiprocessing computers, and computer network. 3 hours lecture, 2 hours lab. Prerequisite: CEG 560, 634.

**721-4 Computer Architecture II**

Continuation of CEG 720 with a more detailed study of lecture and laboratory topics. 3 hours lecture, 2 hours lab. Prerequisite: CEG 720.

**750-4 Microprocessors**

Study of microprocessors and the use of microprocessors in digital systems. Fundamentals of microprocessor software, assembly-level programming for microprocessor applications, memory and interface considerations, and systems employing microprocessors. 3 hours lecture, 2 hours lab. Prerequisite: CEG 653.

**751-4 Microprocessors II**

Interaction of microprocessors and the outside world. Data acquisition and real-time control. Bus interfacing and direct memory access. Multiple processor environment and distributed processing. Small real-time operating systems. Project management. 3 hours lecture, 2 hours lab. Prerequisite: CEG 750.

**752-4 VLSI**

(Listed jointly with ESE 752.) Introduction to the techniques, limitations, and problems in the design of VLSI. Topics include NMOS, CMOS technologies, design rules, chip planning, layout, testability, and simulation. Prerequisite: CEG 560; CEG 720 or ESE 710.

**753-4 VLSI II**

(Listed jointly with ESE 753.) A continuation of CEG 752 with a more detailed study of lecture topics and testing and evaluation of chips implemented in CEG 752. Prerequisite: CEG 752.

**756-4 Robotics**

(Listed jointly with ESE 756 and MSE 756.) Detailed study of the dynamics and control of robotic systems. Material covered includes trajectory planning, rigid-body dynamics, rotating coordinate systems, and computer implementation of various adaptive and optimal control schemes. Prerequisite: CEG 634, 656; ESE 627 or 720.

**757-4 Robotics II**

(Listed jointly with ESE 757 and MSE 757.) Study of programming and vision techniques applicable to the control of robotic systems. Material covered includes robot languages, teach mode, image processing, scene analysis, and pattern recognition. Prerequisite: CEG 756.

**760-4 Software Engineering I**

Introduction to software engineering. Fundamentals of problem specification, program design, verification, and evaluation are explored. Students participate in team projects to apply the methods introduced. Prerequisite: CS 666, 680, or 784.



**761-4 Software Engineering II**

Continuation of CEG 760. Selected topics introduced in CEG 760 are explored in greater depth. Student projects from CEG 760 are used as subjects for detailed analysis and evaluation. Prerequisite: CEG 760.

**790-4 Selected Topics in Computer Engineering**

Lectures on and study of selected topics in current research and recent developments in computer engineering. May be taken for letter grade or pass/unsatisfactory. Titles vary.

**795-1 to 4 Independent Study**

Special problems in advanced computer engineering topics. May be taken for letter grade or pass/unsatisfactory.

**799-1 to 8 Thesis****890-1 to 4 Selected Topics**

Selected topics in computer science and engineering.

**891-1 Ph.D. Seminar**

Continuous registration in the Ph.D. seminar is required of all students seeking the Ph.D. in computer science and engineering. Graded pass/unsatisfactory.

**892-12 General Exams**

Examination that tests understanding of the fundamentals necessary to begin concentrated study in a chosen Ph.D. research area. Composed of written tests and an oral exam. Must be passed within two attempts. Graded pass/unsatisfactory.

**894-1 Candidacy Exam**

Examination that tests for depth and understanding in a chosen computer science and computer engineering research area. Includes a written proposal for a Ph.D. topic and an oral examination which is open to the public. Graded pass/unsatisfactory.

**895-1 to 8 Independent Study**

Independent study in a chosen area for Ph.D. research.

**896-1 Dissertation Defense**

Examination on the Ph.D. dissertation. The written dissertation is submitted and must be successfully defended in the oral exam conducted by the dissertation committee. Graded pass/unsatisfactory.

**897-12 Residency Research**

Research on the Ph.D. dissertation topic taken in residence.

**898-1 to 12 Dissertation Research**

Research on the Ph.D. dissertation topic not taken in residence. Graded pass/unsatisfactory.

**Computer Science/CS**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

CS 516, 517, 600, and 633, and CEG 520, 560, 630, and 631 are considered background for entering students and are *not* counted in the 45 credit hours required for the degree.

**516-4, 517-4 Numerical Methods for Digital Computers**

(Listed jointly with MTH 516, 517.) Introduction to numerical methods used in the sciences. Includes methods of interpolation, data smoothing, functional approximation, integration, solutions of systems of equations, and solutions of ordinary differential equations. 3 hours lecture, 2 hours lab. Prerequisite: for 516, CS 145 or 210, MTH 231, 253 or 355, or permission of instructor; for 517, CS 516, MTH 233.

**600-4 Data Structures and Software Design**

Study of the implementation of data structures and control structures in professional computer programs. Introduction to the fundamentals of complexity and analysis. Study of common standard problems and solutions (e.g., transitive closure and critical paths). Emphasis is on high-level language software design. 3 hours lecture, 2 hours lab. Prerequisite: CS 146, MTH 253, 257.

**605-4 Introduction of Database Management Systems**

Survey of logical and physical aspects of database management systems. Hierarchical, network, and relational models of a database are presented. Physical implementation methods are discussed. Students are given experience creating and manipulating a database. Students must show ability to apply the concepts to the design of database systems. 3 hours lecture, 2 hours lab. Prerequisite: CS 600.

**607-3 Optimization Techniques**

(Listed jointly with MTH 607.) Concepts of minima and maxima; linear programming; simplex method; density, and duality; transportation and assignment problems, dynamic programming. Prerequisite: MTH 233, 253 or 355.



**610-4 Theoretical Foundations of Computing**

(Listed jointly with MTH 610.) Examines the limitations of algorithmic processes in problem solving. The following approaches to this issue are presented: Turing machines, Markov algorithms, recursive functions, and the methods of Kleene and Post. Other topics include Church's hypothesis as well as the halting problem and related decision problems. 3 hours lecture, 2 hours lab. Prerequisite: Completion of at least one 300-level math or statistics course and CS 600; or a 400-level math course and CS 145 required.

**658-3 Applied Graph Theory**

(Listed jointly with MTH 658.) Introduction to methods, results, and algorithms from graph theory. Emphasis on graphs as mathematical models applicable to organizational and industrial situations. Prerequisite: CS 145, MTH 231.

**666-4 Introduction to Formal Language**

Introduction to the theory and application of formal languages. Emphasis on those classes of languages commonly encountered by computer sciences (e.g., regular and context-free languages). 3 hours lecture, 2 hours lab. Prerequisite: MTH 257, CS 600; or MTH 257 and completion of a 600-level math or statistics course.

**670-4 Systems Simulation**

Introduction to simulation and comparison with other techniques; discrete simulation models; introduction to queuing theory and stochastic processes; comparison of simulation languages; simulation methodology; selected applications of simulation. Students must show ability to solve problems using simulation techniques. 3 hours lecture, 2 hours lab. Prerequisite: CS 600, STT 560.

**680-4 Comparative Languages**

Basic concepts and special purpose facilities in programming languages, examined through several representative languages. 3 hours lecture, 2 hours lab. Prerequisite: CS 600.

**699-1 to 5 Selected Topics**

Study of selected topics in computer science. Titles vary. May be taken for a letter grade or pass/unsatisfactory.

**700-3 Principles of Instruction in Computer Science**

A survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For graduate teaching assistants in the Department of Computer Science only.

**701-4 Database Systems and Design**

Introduction to basic goals and techniques in the design and implementation of information retrieval systems. Input, file organization, search strategies, output, language design, and evaluation techniques are covered. 3 hours lecture, 2 hours lab. Prerequisite: CS 605.

**702-4 Database Systems and Design II**

Continuation of CS 701, with emphasis on relational databases and distributed systems. Current literature is reviewed. Includes at least one programming project to bridge the gap from theory to practice. Prerequisite: CS 701.

**710-4 Artificial Intelligence**

Problem-solving methods in artificial intelligence (AI) with emphasis on heuristic approaches. Topics include methods of representing and searching the problem-state space, problem reduction analysis, and/or trees, resolution principle, and survey of a number of AI projects. 3 hours lecture, 2 hours lab. Prerequisite: CS 600, 340 or LISP programming experience.

**711-4 Artificial Intelligence II**

Follow-up course to CS 710 covering recent artificial intelligence projects in a variety of areas. Material is taken from reports and journal articles, and is presented by students as well as by the instructor. 3 hours lecture, 2 hours lab. Prerequisite: CS 710, 340 or LISP programming experience.

**712-4 Artificial Intelligence III**

Artificial Intelligence programming techniques including knowledge representation via frames, productions, and predicate calculus. Also included are AI program control structures and techniques relevant to expert system design. 3 hours lecture, 2 hours lab. Prerequisite: CS 340 or LISP programming experience; CS 710, 711.

**716-4 Numerical Analysis I**

(Listed jointly with MTH 716.) Mathematical analysis of numerical methods used in the sciences. Includes selections from the following topics: matrix and iterative methods of solving systems of equations; computation of eigenvalues and eigenvectors; polynomial approximation; interpolation; integration; ordinary differential equations; boundary value problems; and partial differential equations. Knowledge of FORTRAN programming language or permission of instructor required. Prerequisite: MTH 233, 333, 355, 432; or equivalent.

**717-4 Numerical Analysis II**

(Listed jointly with MTH 717.) Continuation of CS 716. Prerequisite: CS 716.

**718-4 Numerical Analysis III**

(Listed jointly with MTH 718.) Continuation of CS 717. Prerequisite: CS 717.



**730-4 Systems Programming**

Study of multiprocess operating systems. Current literature in models for distributed process computation. 3 hours lecture, 2 hours lab. Prerequisite: CEG 634.

**731-4 Systems Programming II**

Continuation of CS 730. In-depth study of a few systems, and a major project. 3 hours lecture, 2 hours lab. Prerequisite: CS 730.

**735-4 Evaluation and Prediction of System Performance**

Introduction to the modeling and analysis of computer system performance as a function of the hardware and software components of the system. 3 hours lecture, 2 hours lab. Completion of a statistics course required. Prerequisite: CEG 633, CS 670.

**740-4 Introduction to the Theory and Analysis of Algorithms I**

Language generation and machine computation models; recursive and partially recursive functions; undecidability; Church's thesis; and equivalence of computing paradigms. 3 hours lecture, 2 hours lab. Prerequisite: CS 666.

**741-4 Introduction to the Theory and Analysis of Algorithms II**

Continuation of CS 740, with emphasis on analysis of the complexity of problems and algorithms. Prerequisite: CS 740.

**760-4 Software Principles I**

Fundamentals of algorithms, data structures, and programming languages are applied to abstract problem solutions and concrete realizations of those solutions. 3 hours lecture, 2 hours lab.

**771-4 Natural Language Processing I**

Survey of computational and linguistic topics pertaining to natural language processing. Emphasis on syntactic issues and parsing. Topics include phrase structure grammars, transformational grammars, transition networks, and function grammars. Prerequisite: CS 666.

**772-4 Natural Language Processing II**

Continuation of CS 771. Computational methods for dealing with natural language semantics are introduced. Topics include semantic networks, conceptual dependency graphs, and formal logic as a semantic model. Prerequisite: CS 771.

**774-4 Logic Programming**

In-depth look at logic programming and logic programming languages. Both application and implementation issues are examined. Prerequisite: CS 680.

**776-4 Functional Programming**

In-depth look at functional programming techniques, and functional languages and their implementation. Prerequisite: CS 680.

**780-4 Compiler Design and Construction**

Complete compiler for a small programming language is discussed. Topics covered are scanning, syntax analysis, and code generation. 3 hours lecture, 2 hours lab. Prerequisite: CS 666, 680.

**781-4 Compiler Design and Construction II**

Continuation of CS 780. Topics are covered in more depth. Project is required. 3 hours lecture, 2 hours lab. Prerequisite: CS 780.

**782-4 Compiler Design and Construction III**

Continuation of CS 781. Concentration on major design project. 3 hours lecture, 2 hours lab. Prerequisite: CS 781.

**784-4 Programming Languages I**

Rigorous examination of the fundamental principles of programming languages. Examples are drawn from a variety of modern languages, including Ada, Prolog, LISP, and Smalltalk. Prerequisite: CS 680.

**785-4 Programming Languages II**

Continuation of CS 784. Emphasis on formal methods for specifying and defining both the syntax and the semantics of programming languages. Prerequisite: CS 784.

**790-4 Selected Topics in Computer Science**

Lectures on and study of selected topics in current research and recent developments in computer science. 3 hours lecture, 2 hours lab.

**795-1 to 4 Independent Study**

Special problems in advanced computer science topics. May be taken for letter grade or pass/unsatisfactory.

**799-1 to 8 Thesis****890-1 to 4 Selected Topics**

Selected topics in computer science and engineering.

**891-1 Ph.D. Seminar**

Continuous registration in the Ph.D. seminar is required of all students seeking the Ph.D. in computer science and engineering. Graded pass/unsatisfactory.

**892-12 General Exams**

Examination that tests understanding of the fundamentals necessary to begin concentrated study in chosen Ph.D. research area. Composed of written tests and an oral exam. Must be passed within two attempts. Graded pass/unsatisfactory.

**894-1 Candidacy Exam**

Examination that tests for depth of understanding in a chosen computer science and computer engineering research area. Includes a written proposal for a Ph.D. topic and an oral examination, which is open to the public. Graded pass/unsatisfactory.



**895-1 to 8 Independent Study**

Independent study in a chosen area for Ph.D. research.

**896-1 Dissertation Defense**

Examination on the Ph.D. dissertation. The written dissertation is submitted and must be successfully defended in the oral exam conducted by the dissertation committee. Graded pass/unsatisfactory.

**897-12 Residency Research**

Research on the Ph.D. dissertation topic taken in residence.

**898-1 to 12 Dissertation Research**

Research on the Ph.D. dissertation topic not taken in residence. Graded pass/unsatisfactory.

## Counseling/CNL

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**661-4 Principles of Counseling**

Overview of major counseling theories and techniques and review of historical foundations of the mental health movement. Social, psychological, and philosophical influences are considered.

**662-4 Problems in Student Personality and Development**

Considers physical, psychological, and personality development of students in terms of the interrelationship of these factors and their effects on student functioning. Family, school, and other social-psychological environments are studied in terms of their effect on behavior.

**663-4 Mental Health I**

Factors influencing the behavior of individuals; methods a counselor may use in observing, analyzing, and improving attitudes and behavior. Graduate standing in education required.

**664-1 to 4 Crisis Intervention Counseling**

Introduces students to the background, theory, practice, and needs of crisis intervention within the helping professions. A variety of crisis intervention models are explored, as are the various community resources available to the crisis intervention worker. Graduate standing required. Prerequisite: CNL 461 or RHB 701 or permission of instructor.

**667-4 Group Background and Theory**

Surveys the background, theory, patterns of function, techniques of facilitating, and the uses of small groups in counseling.

**670-1 to 6 Counseling Workshop**

Selected topics in the human services area on a workshop or a one-time class basis are considered. Topics and titles vary.

**751-3 Counseling Skills for Educators**

Assists teachers in developing an understanding of the counseling needs of children. Teachers develop counseling skills needed to assist students in the classroom. Appropriate referrals to other school professionals are discussed.

**761-4 Psychometrics**

Surveys psychological tests and measurements with emphasis on attitude, interest, and personality tests. Understanding of basic principles and their applications to counseling are stressed. Prerequisite: ED 751.

**762-4 Career Development and Information Services**

Presents career development as a series of vocational/avocational choices in the process of self-realization and considers the effect of rapid social and technological change on this process.

**763-4 Theories of Counseling**

Investigation of the theoretical models that are basic to counseling function and practice as applied to the therapeutic situation.

**765-4 Pupil Personnel Services in the School and Community Resources**

Presents theoretical aspects concerning the organization and administration of guidance services; practical application of principles to schools and other organizations. Surveys social agencies, both public and private, that counselors should be familiar with. An analysis of the referral process and the methods of interagency cooperation.

**766-3 Occupational and Educational Information**

Considers the development of an educational/occupational library for students; the classification of the world of work and its implications for vocational counselors; the evaluation of vocational and scholarship materials; and the use of occupational data in career counseling.

**767-3 Group Processes in Counseling and Guidance**

Serves as an introduction to group counseling practice. Considers interaction patterns and dynamics within small groups, and focuses on understanding of individual and group behavior as they relate to the individuals taking the course. Evaluation and research of group processes are also considered.

**768-3 Community Resources in Counseling and Guidance**

Surveys social agencies, both public and private, that counselors should be familiar with. An analysis of the referral process and the methods of interagency cooperation and actual on-the-site visitation. Voids in services and areas of unmet human needs are outlined, and the methods of social action essential to changing old agencies are developed.



**769-4 Techniques of Child Counseling**

Stresses the theories and techniques of counseling children. Discusses the differences between counseling with adults and counseling with children. Specific aspects considered are role and function of a child counselor, group and individual counseling with children, vocational information for children, scholastic and personality testing of children, and treatment methodology (including play therapy, family counseling, and teacher collaboration). Prerequisite: RHB 701.

**770-1 to 3 Independent Study/Minor Problems**

Planned reading and/or project under the guidance of a counselor education program faculty member.

**773-4 Mental Health II**

Acquaints students with preventive mental health, advocacy roles, legal and ethical issues, and interdisciplinary approaches to community mental health.

**778-4 Techniques of Play Therapy**

Investigation of the techniques of play therapy for children ages three to twelve. An advanced seminar for students interested in individual and group play and its therapeutic implications for schools and agencies. Prerequisite: CNL 863 or permission of instructor.

**779-4 Marriage and Family Counseling**

Considers principles and techniques of marriage and family counseling from a variety of theoretical orientations. Laboratory and/or field experience may be required. Prerequisite: RHB 701.

**780-4 Systems Theory and Family Counseling**

Introduces family systems counseling. Covers three interacting components: systems theory, Buckley's sociocultural analysis of systems theory, and the application of a systems analysis to the major views of family counseling. Prerequisite: RHB 701, CNL 863, 779 or permission of instructor.

**781-4 Advanced Techniques of Family Counseling**

Advanced technique and intervention course that focuses on family systems interventions. Emphasis on applications of family counseling, providing in-depth treatment of the major approaches to family counseling. Prerequisite: RHB 701, CNL 863, 779, 780 or permission of instructor.

**782-4 Techniques of Marital Counseling**

In-depth overview of marital counseling. Focuses on techniques and interventions that emphasize the application of the major schools of marital counseling. Course is experientially and performance focused; student participation is encouraged and expected in a variety of role-playing situations. Prerequisite: CNL 779, 780, RHB 801, CNL 863 or permission of instructor.

**829-5 Internship in School Psychology**

Supervised field practice in school psychology. (Previously listed as ED 829.)

**854-4 Intellectual Assessment for School Psychologists**

Introduction to theoretical aspects of individual intelligence testing. Supervised clinical practice in the administration of the Stanford-Binet-R and the Wechsler intelligence scales. For school psychology majors only. (Previously listed as ED 854.)

**855-4 Individual Assessment of Exceptional Children and Youth**

Supervised clinical practice in the administration of standardized and criterion-referenced tests used in the assessment of various exceptional populations, birth to adulthood. For school psychology majors only. Prerequisite: CNL 854 or permission of instructor. (Previously listed as ED 855.)

**856-4 Individual Assessment of Behavior and Personality Disorders**

Introduction to the characteristics of children with behavior and personality disorders. Supervised clinical practice in the application of behavioral management techniques and selected projective tests. For school psychology majors only. Prerequisite: CNL 854. (Previously listed as ED 856.)

**857-4 Practicum in School Psychology**

Application of assessment, consultation, and team planning skills in a school setting under the supervision of a certified school psychologist. (Previously listed as ED 857.)

**860-1 to 6 Advanced Seminar in Counseling**

Provides an opportunity for advanced students to work on problems of their own selection under faculty supervision.

**861-3 Individual Intelligence Testing I**

Focuses on theories and techniques of individual intellectual appraisal. Students learn to administer, score, and interpret the Stanford-Binet Intelligence Scale, Form L-M, for individuals of varying age levels. Prerequisite: RHB 705.

**862-3 Individual Intelligence Testing II**

Focuses on the Wechsler Intelligence Scale for Children and the Wechsler Adult Intelligence Scale. Students study the background and learn to administer, score, and interpret the Wechsler tests for individuals of varying ages. Prerequisite: CNL 761.

**863-4 Techniques of Counseling**

Laboratory practice in individual counseling techniques; focuses on the development of basic skills and procedures. Prerequisite or corequisite: RHB 701.



**864-1 to 4 Practicum I: Individual**

Provides an experience in counseling and guidance in that students, under supervision, actually counsel individuals in educational, vocational, and personal areas. Prerequisite: CNL 863.

**865-4 Individual Practicum**

Provides an experience in counseling and guidance in that students, under supervision, actually counsel individuals in educational, vocational, and personal areas. Prerequisite: CNL 863.

**866-4 Advanced Individual and Group Practicum**

Provides an experience in counseling and guidance in that students, under supervision, actually counsel individuals and groups in educational, vocational, and personal areas. Prerequisite: CNL 863.

**867-1 to 12 Internship**

This field-based experience provides human services master's degree students with advanced clinical practice and supervision in their major specialty areas. Prerequisite: CNL 865, 866 or RHB 801, 802 or permission of instructor.

**868-1 to 4 The Role and Function of the School Psychologist**

Overview of the school psychologist's role and function. Considers the history and ethical and legal issues of the profession. Emphasizes the consultation, teaming, assessment, in-service, and counseling aspects of the role. Course is taken concurrently with the assessment sequence and internship in the school psychology program. (Previously listed as ED 868.)

**960-1 to 4 Advanced Institute for Human Services Personnel**

Individual and group study of current problems and issues for counselors. Also provides a focus on the development of new skills related to counseling interventions. Topics might include professional ethics and responsibilities, crisis intervention and human sexuality. Topics vary.

**961-3 Counseling the Gifted**

Overviews the special social/emotional needs of gifted children and youth. Focuses on techniques to help gifted children experience their emotions, and to develop awareness and understanding of themselves. Prerequisite: ED 722 or permission of instructor.

**971-4 Counseling for the Life-Span Development**

Developmental factors influencing the behavior of individuals across the life-span and the unique counseling strategies that are employed with clients in the human services at different points on the life-span continuum. Prerequisite: CNL 863, ED 751, RHB 701.

**972-4 Legal, Professional, and Ethical Issues in the Human Services**

Surveys the various legal, professional, and ethical concerns most often encountered by human service providers. Prerequisite: CNL 773, 863; RHB 701.

**973-4 Social and Cultural Foundations in Counseling**

Focuses on studies of change, ethnic groups, subcultures, changing roles of women, sexism, urban and rural populations, and differing life patterns. Involves experiential and didactic material and looks at individual attitudes and beliefs. Prerequisite: CNL 663, 773, 863; RHB 701.

## Economic Education, Center for/ECO

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

Courses offered through the Center for Economic Education do not apply toward the M.B.A. or M.S. degree in social and applied economics.

**500-3 Consumer Economics for K-12 Teachers**

An examination of consumers as they participate in the economy. Emphasis on those householder roles (consumer/producer/citizen) that are teachable in the K-12 classroom. May be taken for letter grade or pass/unsatisfactory.

**511-3 Principles of Economics for Teachers I**

Basic microeconomic principles for K-12 teachers. Participants study the tools of analysis and operations of the parts of the economy. May be taken for letter grade or pass/unsatisfactory.

**512-3 Principles of Economics for Teachers II**

Survey of basic macroeconomic principles for K-12 teachers. Participants study the tools of analysis and operations of the whole economy. May be taken for letter grade or pass/unsatisfactory.

**513-3 Principles of Economics for Teachers III**

Advanced micro- and macroeconomic principles for K-12 teachers. Participants study the tools of analysis and operations of the parts and the whole of the economy. May be taken for letter grade or pass/unsatisfactory.

**514-3 Economic Studies for Teachers: Economics in Action**

Selected economic issues and topics for teachers, presented in dialogue with visiting resource persons. May be taken for letter grade or pass/unsatisfactory. Prerequisite: ECO 511, 512, or equivalent; or permission of director of the Center for Economic Education.



**515-3 *Economic Studies for Teachers: Materials/Methods***

Economic education materials and methods for the K-12 classroom. May be taken for letter grade or pass/unsatisfactory. Prerequisite: ECO 511, 512, or equivalent; or permission of director of the Center for Economic Education.

**516-1 to 6 *Economic Studies for Teachers***

Selected economic issues and topics and techniques for teaching them in the K-12 classroom. May be taken for letter grade or pass/unsatisfactory. Prerequisite: ECO 511, 512, or equivalent; or permission of director of the Center for Economic Education.

**523-3 *Family Financial Security***

Financial planning and the family, with emphasis on aspects teachable in the K-12 classroom. May be taken for letter grade or pass/unsatisfactory.

**728-3 *Curriculum and Materials in Economic Education***

Analysis of teaching materials available in economic education, with emphasis on curriculum and teaching-unit development. May be taken for letter grade or pass/unsatisfactory.

## Economics/EC

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**621-3, 622-3 *Graduate Survey in Principles of Economics***

Basic micro- and macroeconomics theory designed for persons having had no previous work in economics.

Economics 621 and 622 are prerequisites for the following courses. Additional requirements are indicated for each course.

**602-3 *Monetary Economics***

Analysis of monetary policy development and the theory of money market behavior. Emphasizes the relationship between money and national economic conditions.

**609-3 *Applied Econometrics***

Application of statistics and economic theory to measurement, forecasting, and other economic problems. Prerequisite: MS 715.

**610-3 *Introduction to Mathematical Economics***

Application of mathematical tools in the formulation of economic theory. Methods used in model construction.

**612-3 *Forecasting Economic Activities***

Techniques and theories used in forecasting. Practical methods and problems are stressed.

**630-3 *Economics of Health Care Services: A Survey***

Explores problems with the current health care delivery system, and examines the political and economic factors responsible for the evolution of the health care system.

**631-3 *Federal Finance and the Economy***

Analysis of federal government expenditures and taxation policies and the impact on economic conditions. Techniques for policy evaluation are discussed.

**632-3 *State and Local Finance and the Economy***

Analysis of different taxation policies of state and local governments. Efficient methods of producing public goods such as education and public health services.

**635-3 *Comparative Economic Systems***

Comparison of the chief characteristics of capitalism, communism, socialism, and fascism to clarify the economic process in a free-enterprise society.

**641-4 *International Trade and the Economy***

Economic reasons for international trade. Impact of trade and trade restrictions on economic aggregates.

**642-3 *International Monetary Theory and Problems***

International monetary relations and problems. Focus is on the institutions and arrangements used to finance international trade. Topics discussed include balance of payments, the dollar and foreign exchange markets, Eurocurrencies, Petrodollars and OPEC, and multinational corporations.

**644-3 *Economic Development and World Poverty***

Economic development in less developed countries as it relates to population growth, cultural change, and industrialization.

**654-3 *Economics of Collective Bargaining***

Development of collective bargaining in the United States; economic cost of labor-management relations.

**715-3 *Applied Microeconomics***

Shows how economic concepts can be used by managers of public and private enterprises. Topics include decision making under uncertainty, demand analysis, production, and pricing.

**717-3 *Applied Macroeconomics***

Explores inflation, employment, growth productivity, capacity utilization, capital formation, and factor prices. International issues are highlighted.

**719-3 *Welfare and Evaluation Theory***

A development of welfare theory that will attempt to apply theoretical constructs to concrete issues such as the development of cost-benefit studies and program planning budgeting. Prerequisite: EC 715.



**721-3 Contemporary Political Economy**

History of economic policy and the evolution of contemporary institutions.

**725-3 Economic and Social Systems I**

Exploration of the philosophical issues in the social sciences, with emphasis on the scientific analysis of value. Comparison of positivist versus instrumental approaches to the scientific analysis of human behavior and their applications to real world problem sets.

**726-3 Economic and Social Systems II**

Contemporary controversial social issues and problems. Emphasis on applying the combined knowledge of the social sciences to the analysis of problem areas. Critical analysis of evolutionary versus revolutionary approaches to problem solving. Prerequisite: EC 725 or permission of instructor.

**730-3 Regional and Urban Economics**

Analysis of the basic forces that shape the economic, social, and physical environment of urban and nonurban regions. Emphasis on regional income determination and developmental models, location of economic activity, the structure of urban centers, intra-urban economic relationships, and economic policy.

**740-3 Cost-Benefit Analysis and Social Project Evaluation**

Application of economic analysis to the evaluation of highway, electricity, water supply, educational, and business investment projects. Prerequisite: EC 715, MS 715, or permission of instructor.

**755-3 The Economics of Health and Health Policy**

(Listed jointly with CME 731 and MGT 755.)

Teaches students how alternative incentive systems and resource allocations affect the health services sector. Emphasis on current institutional arrangements, empirical studies, and policy alternatives.

**760-12 Internship**

Titles vary. One-quarter internship working in a selected private, social, or governmental organization under the direction of a faculty adviser and work supervisor. Graded pass/unsatisfactory.

**765-3 Labor Market Theory and Policy**

Blends theoretical analyses of the forces affecting labor market processes with empirical investigation of labor market conditions and analyses of existing and proposed labor market programs and policies.

**777-3 Economic Studies**

An examination of special issues.

**780-3 Economic Problems Seminars**

Titles vary. Six hours of seminar must be selected from the following topics: economics of the workforce; regional and urban problems; environmental issues; technological change; economic development; economics of poverty; and income maintenance. Completion of introductory statistics course or equivalent 600-level survey course required. Prerequisite or corequisite: EC 715, 717, or permission of instructor.

**781-2 to 4, 782-2 to 4, 783-2 to 4 Research in Economics**

Titles vary. Intensive reading or research in selected fields of advanced economics.

**Education/ED**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**601-3 Human Relations in Education**

Acquaints students with the effect of their own input in communication-interpersonal transaction situations with the objective of developing self-directed behavior and the ability to facilitate self-expression in others. Small groups are used as learning laboratories for this purpose.

**603-3 to 4 Child Development**

Factors that influence growth and development.

**604-3 Adolescent Development**

Examination of the period in the sequence of development known as adolescence, with emphasis on physical development and its psychological and social concomitants and to the effect upon the adolescent of social forces, especially schools.

**605-1 to 4 Current Tendencies in Education**

Current trends and theories in education, and the development of criteria and procedures for their evaluation and implementation.

**606-3 Survey of Vocational Education**

An overview of the instructional programs in vocational education with emphasis on the types of programs, their administration, and their relationship to other phases of education. The vocational services covered include business and office education, distributive education, agricultural education, home economics education, industrial arts education, health occupations, technical education, trade and industrial education, and vocational guidance.

**607-3 Cooperative Office Education**

Qualifying course for cooperative office education programs. An overview, with emphasis on coordinating techniques applicable in high school, post-high school, and adult training areas. Prerequisite: ED 633 or equivalent.



**608-3 Intensive Office Education**

Qualifying course for intensive office education programs. Comprehensive study in developing procedures and principles in program construction, selection, improvement, implementation, and development of program guidelines. Prerequisite: ED 633 or equivalent.

**609-4 Early Childhood Curriculum and Materials: Sociocultural**

Historical, philosophical, and sociological aspects of early childhood education. Emphasis on the development of race awareness in young children and the development of self concept.

**611-4 Early Childhood Education**

History and development of early childhood education and introduction to early childhood professions. Focus on job opportunities, professional organizations, and the needs and developmental levels of the young child. Basic information about skills and competencies necessary for teaching young children.

**612-4 Kindergarten: Curriculum and Materials**

Various types of early childhood programs in the United States. Research in their historical backgrounds. Review of basic human growth and learning principles significant for understanding young children, prenatal through age eight. Focus on planning effective preschool and early learning programs.

**613-3 Inductive Geometry in the Elementary School**

Prepares elementary school teachers to teach geometrical concepts included in today's K-6 mathematics program. Emphasis on an informal approach to teaching the use of experimentation, intuition, and guided discovery. Prerequisite: ED 704.

**614-4 Early Childhood Education Curriculum and Materials: Language**

Emphasis on the study of existing commercial materials for preschool language development, evaluation of these materials, and design and presentation of supplementary and basic teacher-made materials. Prerequisite: ED 403 (603), COM 421 (621).

**615-3 Improvement of Elementary Reading Instruction**

Curriculum, methods, materials, and evaluation in reading designed to improve the teacher's instructional skills.

**616-3 to 4 Improving Science Instruction in the Elementary School**

Consideration of selected scientific principles that have particular application in the elementary school. Inquiry through a laboratory approach is emphasized.

**617-3 to 4 Elementary School Social Studies: Curriculum and Materials**

Objectives, principles, and trends in elementary social studies education. Prerequisite: ED 704 or permission of instructor.

**618-3 to 4 Problem Solving in School Mathematics**

Prepares teachers of mathematics in grades K-8 to teach problem solving as a basic mathematical skill. Emphasis on the teaching/learning of a variety of problem solving heuristics, applying problem solving strategies, and the use of both routine and nonroutine in school mathematics.

**620-2 to 4 Studies in English Education**

Focuses on theoretical issues and practical problems of the teaching of English at all levels to meet the needs of teachers of English to speakers of other languages (TESOL). Includes theory and evaluation procedures for TESOL. May be taken for letter grade or pass/unsatisfactory.

**623-3 Secondary School English: Curriculum and Materials**

Curriculum, methods, and materials for the language arts in the secondary schools; current trends in the teaching of English. Prerequisite: ED 663 or equivalent.

**624-3 Secondary Speech and Drama: Curriculum and Materials**

Curriculum and materials for those preparing to teach speech and drama in secondary schools. Course covers teaching methods, class organization, production of plays, and cocurricular activities. Prerequisite: ED 663 or equivalent.

**625-3 Modern Foreign Languages: Curriculum and Materials**

The modern language curriculum in the public schools; purposes, methods, materials. Prerequisite: ED 663 or equivalent.

**626-2 to 4 Outdoor Education**

Provides teachers and leaders seeking skills in the use of the out-of-doors as a resource for program or curriculum enrichment with laboratory experiences and field work in a variety of biotic communities. Ecological relationships are emphasized.

**630-3 Teaching About Religion in the Public Schools**

(Listed jointly with REL 630.) Introduction to the historical background and court decisions pertaining to teaching about religion in the public schools, current ways that religion is taught in the public schools, and new experimental approaches to teaching about religion.

**631-3 Secondary School Science: Curriculum and Materials**

Curriculum and materials for teaching science with emphasis on clinical experiences, approaches to teaching, the professional literature, resources and facilities, and curricular trends in science education. Prerequisite: ED 704 or permission of instructor.



**632-3 Improving Reading in Secondary Schools**

Surveys the teaching of reading in American secondary schools including the skills necessary to teach reading in the content subjects. Not open to reading majors.

**633-4 Business Education Curriculum and Materials: Basic Business Subjects**

Business education philosophy, objectives, and curricula on the secondary level of instruction. Curriculum and materials in basic business subjects, bookkeeping, data processing, and sales communication. Prerequisite: ED 214, 216, 218, 220 or equivalent. Corequisite: ED 327.

**634-4 Business Education Curriculum and Materials: Typewriting, Keyboarding, Word Processing, and Office Procedures**

Curriculum, methods, and materials in typewriting, keyboarding, word processing, and office procedures in the secondary school; current trends in teaching typewriting, keyboarding, word processing, and office procedures. Prerequisite: ED 433, OA 213.

**635-3 Business Education Curriculum and Materials: Shorthand, Transcription, and Secretarial Procedures**

Curriculum, methods, and materials in teaching shorthand, transcription, and secretarial procedures. Prerequisite or corequisite: ED 322; OA 213. Corequisite: ED 327.

**637-3 Elementary School Mathematics: Curriculum and Materials**

Instructional materials and methods of meaningful explanations of mathematics in the elementary school based on structural properties of number and numeration system studies at this level. Prerequisite: MTH 243 or equivalent.

**638-3 Secondary School Mathematics: Curriculum and Materials**

Curriculum, methods, and materials in mathematics for grades 7-12. Prerequisite: ED 644, 701, 704, 710, or equivalent.

**639-3 Secondary School Social Studies: Curriculum and Materials**

Objectives, principles, and trends in secondary social studies education. Prerequisite: ED 704.

**641-3 Mental Retardation and Developmental Disabilities**

Overview of causes and effects of mental retardation and related developmental disabilities in home, school, and community settings. Prerequisite: ED 119 or teaching experience; ED 603, 701, or equivalent.

**642-4 Curriculum, Methods, and Materials for the Mildly Handicapped**

Practices and procedures used in developing elementary and secondary curricula for the mildly handicapped. Includes academic adaptations, social and motor skills development as applied to development, and implementation of the Individual Education Plan (IEP). Field/clinical experiences required. Prerequisite: ED 655.

**643-3 Introduction to Augmentative Communication**

Introduces etiology, problems, and needs of nonspeaking individuals. Hands-on experiences are required using augmentative aids and devices with multiply handicapped individuals. Prerequisite: ED 651 or experience with multiply handicapped individuals.

**644-3 Instructional and Behavioral Management of Exceptional Individuals**

Prepares special educators to meet the instructional and behavioral management demands particular to working with exceptional individuals including those with severe behavior difficulties. Pre- or corequisite: ED 651 or 655. (Previously listed as ED 802.)

**645-3 Career Education and Occupational Training for Exceptional Individuals**

Role of occupational training in the curriculum; relationships with the world of work; problems of organizing and administering; methods and techniques used in developing occupational interests and abilities at various levels. Direct work with clients required. Prerequisite: ED 651 or 655 or RHB 301 or 702.

**647-4 Teaching in the Public School**

Study, observation, and evaluation of practices. Offered only to students who have completed the pertinent curriculum and materials course and are seeking a waiver of all or part of student teaching on the basis of full-time teaching experience.

**648-3 Improvement of Social Studies Instruction**

In-depth analysis of new social studies resource materials and curriculum modes with emphasis on improving instruction. Completion of a social studies methods course required.

**650-3 Computer Science: Curriculum and Materials**

Prepares teachers to teach computer science in a precollege setting. Curriculum, teaching methodology, and the computing teacher's role in computer science, grades K-12. Prerequisite: ED 214, 216, 218, 220 or equivalent; ED 302 and 327.

**651-3 Nature and Needs of the Multiply Handicapped**

Review of etiological aspects; historical, educational, and training programs; and concerns and issues related to multiply handicapped individuals including mildly, moderately, severely, and profoundly retarded or physically handicapped. Prerequisite: Teaching Certificate or ED 603 or 604.



**652-3 Education of Individuals with Physical, Sensory, and Motor Disorders**

Overview of the etiology and educational implications of physical disabilities, sensory deficits, and communication disorders. Emphasis on psycho-educational and physical needs of children and youth, including the adaptation of methods and materials. Prerequisite: Teaching Certificate or ED 603 or 604.

**653-3 Curriculum, Methods, Materials, and Adaptive Equipment for Multiply Handicapped**

Review of organizations, methods, and techniques for educating and training multiply impaired children, youth, and adults. Surveys opportunities available for recreation, leisure time, and work habilitation. Prerequisite: ED 651, 652, 644.

**654-3 Administration and Interpretation of Educational Data**

Administering and interpreting formal and informal educational assessment instruments and communicating assessment data to parents and colleagues. Pre- or corequisite: ED 655.

**655-2 to 4 Nature and Needs of the Mildly Handicapped**

Causes and effects of specific learning and language disabilities, severe behavior disorders, and mild developmental disabilities. Study of teaching strategies appropriate for these individuals. Prerequisite: ED 603 or 604 or Teaching Certificate.

**656-4 Clinical Practice in Remediation**

Supervised clinical practice in the diagnostic teaching of exceptional individuals. Emphasis on assessment, reading, and math curriculum and materials. Prerequisite: ED 637, 615 or 632, 655, 642, 654. Nonspecial education majors do not need ED 642 and 655.

**658-1 to 9 Practicum in Education**

Supervised teaching experience for students who have completed student teaching or its equivalent and are seeking certification in another field. Titles vary.

**659-3 Communication and Consultation Skills for Special Educators**

Techniques of collaborative consultation needed to enhance communication with exceptional individuals, parents, and educational team members. Pre- or corequisite: ED 655 or 651.

**660-1 to 4 Practicum in English Education**

Students are assigned to an instructional class that focuses on the teaching of English to speakers of other languages (TESOL) for supervised practicum experience. Graded pass/unsatisfactory. Prerequisite: ED 620.

**661-6 Studies in the Social Foundations of Education**

The interrelationship of social forces and education. Introduction to the multicultural/pluralistic make-up of schools, the theoretical bases of social issues in contemporary society, and their application to the educational process and schooling.

**662-6 Studies in the Psychological Foundations of Education**

Psychological theories, principles, and processes that affect teaching and learning. Focuses on learning theory, teaching behavior, student needs, and the skills necessary to maintain an optimum learning environment.

**663-3 Teaching Skills and Strategies**

Explores the use of basic skills in planning, motivation, and questioning, as well as the use of audiovisual equipment and production, alternative instructional strategies, and management techniques that help facilitate instruction.

**664-3 to 4 Evaluation**

Evaluation of learning, including selected forms of measurement and interpretation of data: sociometric techniques, anecdotal records, and testing.

**665-6 to 15 Supervised Teaching: Elementary**

Students are assigned to a public school full time for teaching under the direct supervision of an experienced classroom teacher. Includes weekly seminar. Graded pass/unsatisfactory.

**666-3 Introduction to Schooling**

The organization and function of schools, legal and financial aspects of schooling, and the rights and responsibilities of those involved in the educational process.

**667-6 to 15 Supervised Teaching: Secondary**

Students are assigned to a public school full time for teaching under the direct supervision of an experienced classroom teacher. Includes weekly seminar. Graded pass/unsatisfactory.

**670-1 to 6 Curriculum and Instruction Workshop**

Intensive study of a selected area of the school curriculum designed to meet the particular needs of the participating preservice and in-service teachers, administrators, and curriculum supervisors. Titles vary.

**700-3 Graduate Assistant Seminar**

Orientation of graduate assistants to the organization and responsibility of the College of Education and Human Services. Selected topics related to specific programs, services, and procedures in the college are considered. For first-year graduate assistants only.

**701-3 Advanced Educational Psychology**

Selected theories of learning and the relationship between the theories and instructional practice. Completion of graduate core courses required.



**702-3 Social Foundations of Education**

Relationship between public education in a democracy and the critical social issues and social forces.

**703-3 Philosophy of Education**

In-depth analysis of the major philosophy of education and emphasis on its implications to the teaching/learning process and the development of a personal philosophy of education.

**704-4 Introduction to Foundations of Education**

The past and present social, philosophical, and psychological trends and issues in education in a democratic society.

**705-3 Affective Education: Principles and Applications**

Analyzing the affective aspects of classroom instruction and interaction, and facilitating the use of affective strategies within the classroom setting. Prerequisite: ED 603 or 604 or permission of instructor.

**706-1 to 6 Workshop in Social Foundations in Education**

Information and techniques used by educators to aid students in specific social, legal, and philosophical aspects that affect education.

**707-3 History of Education**

Origin and development of educational institutions in the United States with emphasis on development of early childhood, elementary, secondary, and higher education.

**708-3 Comparative Education**

Analysis of educational systems as related to the values and cultures of selected countries.

**709-4 Applied Psychological Learning Theory**

Selected theories of learning and their value to instructional practices. Emphasis on the relationships among learning theories, learner characteristics, motivational theories, and instructional practices.

**710-4 Classroom Strategies for Atypical Populations**

Focuses on curricula, materials, strategies, and techniques for instructing learners with cultural, social, economic, and intellectual differences.

**711-3 Foundations of International Education**

Factors influencing educational systems and practices throughout the world.

**713-3 Working with Parents of Young Children**

Study and practicum in homebound, early-intervention, and parent-involvement programs. Prerequisite: ED 611 or permission of instructor.

**714-3 Creativity and Self-Concept of the Young Child**

Relationship of self-concept and creativity in the young child; exploration of commercial materials for self-concept; planning and presentation of student-constructed evaluation materials. Prerequisite: ED 611 or permission of instructor.

**715-3 Role of Administrator in Early Childhood Education**

Planning, implementation, coordination, supervision, and direction of early childhood programs. Prerequisite: ED 611 or 612 or permission of instructor.

**716-3 Foundations of Reading Instruction**

Development of effective reading instruction based on children's language acquisition and development.

**717-3 Early Childhood Curriculum and Materials: Mathematics and Science Readiness**

Development of numerical and scientific concepts in young children, with emphasis on development of curriculum and materials for nursery, preschool, and kindergarten children. Prerequisite: ED 611, 612, or permission of instructor.

**718-3 Curriculum and Instruction in Elementary School Mathematics**

Analysis of the current curriculum, techniques of instructional improvement, and classroom management strategies. Prerequisite: ED 618 or equivalent.

**719-3 Supervision of Student Teachers**

Principles and methods of supervision, including observation, analysis, and guidance. For in-service elementary and secondary teachers who wish to prepare themselves for the responsibilities of cooperating teachers in the university student teaching program.

**720-3 Creative Problem Solving in Classrooms**

Introduction to creative problem-solving models and approaches that can be used by classroom teachers to involve students in the solutions of problems.

**721-3 Literature for Elementary Children**

Extension and enrichment of knowledge of children's books. Introduction to research and scholarly and critical writing about children's literature in relation to classroom practices. Application of research and criticism ideas; exploration of internationalism in children's literature.

**722-3 Gifted Children and Youth**

Overview of the characteristics of gifted children and youth. The historical and current aspects of education of the gifted, and family problems and vocational concerns.

**723-1 to 3 Teaching the Gifted**

(Listed jointly with AED 741.) Study of curriculum, materials, and methods appropriate for teaching gifted individuals. Local program models are presented and observed in class. Prerequisite: ED 722.



**724-3 Foundations of Business Education**

Philosophy and objectives of the business education and vocational business and office education curricula on the secondary and postsecondary levels of instruction. Guidance, selection, and placement of students and contemporary influences on business education and vocational business and office education are included.

**725-3 Administration and Supervision in Vocational Business and Office Education**

Organization of vocational business and office education in the United States, especially in Ohio. Examination of evaluative criteria for departments of vocational business and office education, teacher selection and supervision, human relations, and the impact of federal legislation.

**726-3 Adult Programs in Vocational Business and Office Education**

Investigation of business and office education programs in community, junior, and technical colleges, including curriculum, special methods, development of curriculum materials, and field participation.

**727-3 Teaching Strategies and Curriculum Trends in Nonskilled Business Education Subjects**

Study of recent developments in the teaching of basic business subjects including vocational programs and the development of appropriate teaching strategies.

**728-3 Curriculum and Materials in Economic Education**

Analysis of materials available, the development of appropriate teaching units, and the application of special methods for teaching economics on the elementary, secondary, and postsecondary levels.

**729-3 Teaching Strategies and Curriculum Trends in Accounting and Data Processing**

Analysis of the curriculum of business education and vocational business and office education in accounting and data processing, and the development of teaching strategies.

**730-3 Teaching Strategies and Curriculum Trends in the Skilled Business Education Subjects**

Analysis of the trends, application of new teaching media, and the development of teaching strategies in typewriting, shorthand, transcription, word processing, office procedures, and office machines.

**732-3 Principles and Practices of the Middle School**

The historical and underlying philosophy of the middle school concept based on the nature of the students. Current and future instructional and curricular practices are viewed in relation to this philosophy.

**733-3 Improvement of Teaching**

Principles and practices for improving instruction. Emphasis on alternative instructional techniques, goal-oriented teaching, instructional self-analysis, and improvement and research findings related to teaching effectiveness.

**734-3 to 4 Analysis of Teaching**

Focuses on teaching methods and skills, and on classroom climate, including microteaching, interaction analysis, and collection of feedback from students.

**736-3 History of Books for Children and Young People**

International children's literature, primarily from the eighteenth century to the twentieth century.

**737-3 Survey of World Literature for Children and Young People**

Students apply the knowledge of international literature and the skills of teaching to the curricula of schools and libraries. Completion of education core courses required.

**738-3 Supervision of Secondary School Mathematics**

Analysis of curriculum, materials, techniques of instruction, and classroom management strategies to improve mathematics programs of secondary schools.

**739-3 Cultural Studies in Literature for Children and Young People**

Students investigate the literature for children and young people of a particular culture, and study its effect within the broad context of world literature. Titles vary.

**740-3 Education of Children with Severe Emotional Problems**

Introduction to the emotionally disturbed child and problems in the classroom. Overview of the major intervention and prevention strategies. Prerequisite: ED 641 or permission of instructor.

**741-4 Instructional Design**

Management and leadership skills as related to organizational patterns, staffing, utilization of space, time, and facilities at the building level.

**742-3 to 4 Curriculum Designing for the Teacher**

Management and leadership skills as related to the development and organization of curriculum and materials; implementation of the learning program with students.

**745-3 Genre Studies in International Literature for Children and Young People**

Students do an in-depth study of a single genre of literature for children and young people focusing on literature of international significance.

**747-4 Leadership for School Improvement**

The development of leadership skills and abilities and the dynamics of team functioning, including decision-making models and processes, problem-solving techniques, communication skills, conflict management, and self-improvement.



**748-3 Teaching Literature to Children and Young People**

Students apply the knowledge of international literature and the skills of teaching to the curricula of schools and libraries.

**751-5 Educational Statistics and Research**

Introduction to educational statistics, research terminology, and methodology.

**752-4 Statistical Analysis and Research Design**

The computation and interpretation of inferential statistics as they relate to the design of educational research. Critical study of research techniques and reporting methods. Prerequisite: ED 751.

**753-4 Advanced Educational Statistics**

Selection, computation, and interpretation of nonparametric statistical techniques for 1 to k samples, either independent or related. Multivariate analysis including analysis of variance-factorial designs, analysis of covariance, and multiple regression. Prerequisite: ED 752.

**754-4 Applied Research and Statistics**

Introduction to educational statistics and research methodology with emphasis on identification of a problem to be researched in participant's own setting.

**755-1 to 5 Research Projects**

Conference course; individual research to satisfy requirements of research study for the Master of Education degree. Prerequisite: ED 752 or permission of instructor.

**757-4 Student Appraisal Methods**

Intensive study of methods constructed and/or used by teachers for appraisal of student progress and adjustment. Includes selection, use, and interpretation of standardized instruments. Prerequisite: ED 751 or equivalent.

**759-4 Research on Teaching**

Research on teaching effectiveness; culminates in the writing of a research proposal to be completed during the second year of the Teacher Leader program.

**761-4 Applied Curriculum Theory**

Overview of past, present, and future curriculum trends and development processes. Students analyze and evaluate an existing curriculum after developing a specific set of criteria.

**762-4 Foundations of Teaching Models**

Focuses on five different models of teaching: concept; attainment; synectics; social inquiry; contingency management; and one model in terms of the model outcomes, assessment of students, and teaching/learning activities.

**763-4 Instructional Management and Evaluation**

Study of the management and evaluation of instruction. Emphasizes uses of systematic management and evaluation models by classroom teachers, and the impact of nonclassroom components of school/society on the teacher's management and evaluation of instruction.

**769-3 Content Reading Instruction Grades 4-12**

Provides means of guiding students' text reading. Strategies for teaching purpose setting, comprehension, vocabulary/concept development, memory development, and test preparation. Prerequisite: ED 716 or permission of instructor.

**770-1 to 3 Independent Reading and Minor Problems**

Planned reading and/or project under the guidance of a College of Education and Human Services faculty member.

**771-3 Educational Leadership Behavior**

Focuses on the development of a strong theoretical base to build skills in leadership, communication, decision-making, problem-solving, and conflict management processes. Change theory and process are also covered.

**772-3 Educational Administrative Behavior**

Principles of educational administrative processes, formal school structures and organization, and an introduction to school administration task areas. Principles of democratic school administration are also studied. Prerequisite: ED 771.

**773-3 Curriculum Theory and Practice**

Developing an understanding of the bases of curriculum, the purposes and organization of curriculum, and curriculum planning. Roles and responsibilities of curriculum planners/developers are covered.

**774-3 Curriculum Organization**

Developing an understanding of goals, pupil performance objectives, components of curriculum design, and organization. Emphasis on language arts, mathematics, science, and social studies curriculum structure and organization. Prerequisite: ED 773.

**775-3 Leadership for Instructional Improvement**

Understanding teaching from research and methodological viewpoints. Emphasis on examining various bases of teaching and improving instruction techniques.

**776-3 Supervision of Instruction and Personnel**

Emphasis on general supervision practices, personnel management, and staff performance evaluation. Prerequisite: ED 775.



**777-1 to 3 Prepracticum: Role and Function of Educational Leaders**

Focuses on the roles performed by practicing educational leaders. Students observe, interact, and draw conclusions from field experience. Class sessions integrate field experience with knowledge and skills studied in prerequisite courses. Prerequisite: ED 771 through 776.

**780-3 Public Relations and Politics in Education**

Developing an understanding of potential structures and effective principles of schools/community relations. Concepts of power, potential networks, pressure groups, and lobbying are examined. Characteristics of effective communication, advisory bodies, and public relation programs are covered. Prerequisite: ED 777.

**781-3 School Finance and Economics**

The financing of public education and the economics of education. Guiding principles for developing financial programs and management procedures are covered. Prerequisite: ED 777.

**782-3 School Law**

Provides an examination of the legal framework that all school personnel must function in. Emphasis on both legal precedents and statutory provisions. Prerequisite: ED 777.

**783-4 School Law and Finance for Educational Leaders**

Examination of the legal and fiscal framework that emphasizes the legal precedents and statutory provisions for the public school as they apply to school districts; administrative government and offices; pupils (admission, attendance, and discipline); teachers, principals, and superintendents; school property and buildings; school funds; and tort liability.

**784-4 Legal and Professional Issues**

The legal framework of compulsion in education, the civil liberties of teachers, curriculum content, and academic freedom. Teachers' rights, duties, and responsibilities to the educative profession.

**785-3 Introduction to Community Education**

History, implementation, progress, publications, role of personnel, and current status of community education.

**786-3 Community School**

Introduction to and exploration of the community school concept.

**787-3 School and Community**

Development of understanding of home and community factors and their relationship to the educational process.

**790-1 to 3 Practicum in Instructional Leadership**

Provides educational leadership degree candidates an opportunity to apply concepts and skills to educational practice, and to evaluate their own leadership effectiveness.

**791-4 Curriculum Design and Evaluation**

Provides curriculum and supervision students with knowledge and skills necessary to perform curriculum and instruction designing and evaluation functions. Prerequisite: ED 777.

**792-4 Models of Supervision and Staff Development**

Understanding self and others and understanding models of supervision and staff development. Emphasis on skill acquisition in the areas of personality data; consultation processes; and designing, implementing, and evaluating staff development programs. Prerequisite: ED 777.

**793-3 Computer Application for Educational Leaders**

Introduction to computers and their applications for educational leaders. Investigation of potential uses of the computer for student learning and school management and administration. Review and evaluation of specific hardware.

**796-4 Organization and Administration of Public Schools**

Principles of democratic school administration; management of teaching and nonteaching personnel; role of administration in facilitating teaching and learning; and school/community relations.

**801-3 Current Issues and Problems in Education**

Issues and problems in elementary and secondary education with emphasis on changing needs, instructional patterns, and curricular organization.

**810-3 Seminar in Elementary Education**

Special areas or problems in elementary education. Topics vary.

**815-3 Teaching Children to Write**

Advanced study in current research theories and process of teaching writing in the elementary schools. Prerequisite: ED 316 or equivalent or permission of instructor.

**816-3 Learner-Centered Reading and Writing**

Provides experience and background in theories and practices of reading and writing that focus attention on the learner. Prerequisite: ED 716, 721, or LCS 663, or equivalent.

**817-3 Organization and Supervision of the Reading Program**

Principles, methods, and techniques of giving leadership in improving the reading program. Emphasis on problems involved in initiating and sustaining change. Prerequisite: ED 615 or 632.



**818-3 Diagnosis and Remediation of Learning*****Difficulties in Elementary School Mathematics***

An examination of how children learn mathematics and why children have difficulty in computation. Participants organize and administer mathematics diagnostic inventories, administer standardized diagnostic tests, interpret the results, and design appropriate remedial activities. Completion of a curriculum and materials course in mathematics or permission of instructor required.

**820-3 to 6 Seminar in Secondary Education**

Individual and group study of problems related to the several teaching areas in secondary school instruction.

**824-3 Curriculum Development for Vocational Business and Office Education**

Comprehensive study of curriculum designs, including occupational task analysis, innovations, sequential structuring, preparation and development of teaching units, evaluation, and change in the vocational business and office education programs.

**825-3 Facilities and Management of Vocational Business and Office Education**

Planning, evaluation, and management of vocational business and office education laboratories and related areas.

**826-3 Coordination Techniques for Vocational Business and Office Education**

Overview of coordination techniques used in a vocational program, including development of appropriate integration and simulations, behavior modification studies, guidance, selection, and placing of students in job situations, and processes used in program.

**827-3 Evaluation of Vocational Business and Office Education**

Developing procedures and involvement in the use of instruments for conducting evaluations for programs including teachers, students, facilities and equipment, and curriculum.

**828-3 Teaching Strategies and Equipment Adaptations for Disadvantaged and Handicapped Students in Business and Office Education**

Developing teaching strategies and equipment adaptations for disadvantaged and handicapped students in business and office education.

**831-3 Reading Instruction in Junior High and Middle Schools**

Strategies for assessing students and materials as a basis for planning reading instruction in content areas in the middle schools.

**835-3 Supervised Field Experience**

Supervised field experience that applies knowledge and skills gained through the program. This course does not meet state requirements for certification in supervision.

**850-3 Seminar in Special Education**

Individual and group study of the problems of exceptional children.

**851-3 Advanced Seminar in Educational Research Design and Analysis**

Individual and group study of ongoing applied educational research. Prerequisite: ED 752.

**858-3 Advanced Educational Measurement: Theory and Practice**

Covers test construction, evaluation, standardization, validation, item sampling, norm setting, criterion referencing, and accountability. Completion of one measurement course or permission of instructor required. Prerequisite: ED 751.

**865-3 Advanced Educational Assessment and Clinical Practices**

Provides experienced teachers with knowledge, skills, and attitudes needed for diagnosis, program planning, and consultation. Field experience included.

**867-1 to 9 Visiting Teacher Internship**

Supervised field practice for visiting teacher certification as required by the state of Ohio.

**869-3 Student Personnel Administration in Higher Education**

Surveys student personnel services in colleges and universities. Consideration is given to the organization, administration, and rationale of these services.

**871-3 Management of the School**

Focuses on the day-to-day operation of a school building and a school system. State requirements are emphasized in relation to operational procedures in all aspects of managing a school and a school system.

**872-3 Staff Personnel Administration**

Hypotheses, concepts, principles, and practices for dealing with school personnel. Areas of recruitment selection, induction, appraisal, development, compensation, and motivation are covered. Legal aspects of personnel management are also covered.

**873-3 Pupil Personnel Administration**

The development of understanding and procedures of administering pupil personnel aspects of school operation. Student accounting and attendance, guidance and counseling functions, classroom management (discipline), and extracurricular/cocurricular activities are covered.

**874-3 School Business Management and Facilities**

Guiding principles for developing adequate financial programs; detailed studies of sources of local, state, and federal revenue; and procedures for management of school funds with reference to budgeting, accounting, and auditing. Operation and management of effective school plant receives equal emphasis.



**890-1 to 3 Practicum in School Administration**

Provides an experience in school administration in which students perform administrative tasks under supervision. Field experience is planned jointly by students and practicum supervisors, and includes activities in all administrative task areas.

**899-1 to 9 Thesis**

Research for thesis in education. Prerequisite: ED 752 or permission of adviser.

The following courses can be used either to obtain additional certification or to upgrade current certification requirements, and usually require a master's degree as a prerequisite. Some of these courses may be applicable to post-master's degree work.

**930-1 to 3 Advanced Seminar for Classroom Teachers: Variable Topics**

Study of the problems related to instruction and to the teacher as a professional. Topics vary.

**933-3 Instructional Leadership**

Provides the specialist an opportunity to explore the topic of instruction in depth and to apply knowledge and strategies to the process of instructional improvement.

**941-3 Planning Educational Futures**

Study of the future of education; rationale and methodology for such a study. Analysis is on forecasting the probable social, political, economic, and intellectual factors.

**960-3 to 12 Advanced Seminar in School Psychology**

Intensive study of current issues in school psychology.

**971-3 Superintendent/Staff/Board Relationships**

Emphasis on goals, purposes, organizational policy formation, climate and culture of a school system, organizational politics, and roles and function of the superintendent, staff, and board of education.

**972-3 Ideas in Education**

Draws on original sources and examines the impact of professional and nonprofessional educational thinkers on American education. The impact of social trends on education is also examined.

**973-3 Research in Educational Leadership**

Focuses on research on schools as organizations, research on educational leadership, and research related to educational content and practice.

**974-3 Seminar in Educational Leadership**

Issues in educational leadership and curriculum leadership. Program development and administrative practice serve as bases for emerging study issues.

**975-1 to 3 Directed Study**

Designed for students enrolled in the Educational Specialist degree program and/or those students admitted to a cooperative doctoral program. Course requirements are determined by students and their assigned program advisers. Minimum requirements involve an individualized set of objectives, learning strategies, and evaluation design. Titles vary.

**985-3 Interpersonal Dynamics: Individual and Organizational**

Focuses on the following concepts applicable to the educational institution: individual and organizational communications, group processes, conflict management, valuing, and giving and receiving feedback. The concepts are used to help participants conceptualize the interpersonal nature of organizations. Participants acquire the skills necessary to function effectively in interpersonal dimensions within educational settings.

**986-4 Organizations as Social Systems**

Focuses on role theory, leadership theory and style, and decision-making theory and practice relative to the institution of education. Emphasis on analyzing organizations and the educational institution in particular through a social systems orientation. Participants are provided with a historical analysis of organizations, the future directions of organizations, and an analysis of current and future educational institutions.

**987-3 Administrative Leadership Skills**

Focuses on the development of leadership skills in relationship to individual and organizational communications, group processes, conflict management, decision making, and problem solving. Participants study and practice the principles of change.

**988-3 Research and the Educational Leader**

Focuses on the practical applications and issues in research as it relates to educational leadership. Participants focus on research design and methodology, sampling techniques, instrument development, proposal writing, and the application of these skills through a research project to be implemented within a public school setting.

**989-3 Politics of Educational Leadership**

Introduces the concepts and languages of power and politics to the educator. Practical problems are discussed from an interdisciplinary viewpoint. Topics include concepts of power, politics, decision making, institutional racism and sexism, and change.



**991-1 to 4 Advanced Seminar in Educational Leadership**

Three basic topics are addressed: (1) Teacher Evaluation and Staff Development offered fall quarter, (2) Issues in Leadership and Management offered winter quarter, and (3) Innovations in Education offered spring quarter.

**992-3 School/Community Relations**

Designed to assist superintendents and principals in their relations with the public.

**993-3 School Business Management**

Guiding principles for developing adequate financial programs, detailed study of sources of revenue, local, state, and federal; procedures in management of school funds with reference to budgeting, accounting, and auditing.

Prerequisite: ED 793 or equivalent.

**994-3 Advanced Seminar for Educational Leaders**

Synthesizes the concepts, skills, and information of the total Educational Specialist program. Reporting each candidate's research project is a part of this course. An integration of the basic purposes of the program with the concentration, cognate, and common curriculum.

**995-3 Advanced Institute for Educational Leaders**

Individual and group study of current problems and new skill development for educational leaders. Topics require multifaceted approaches and investigations. Topics might include personnel management related to negotiations, human rights, or decision making. Topics vary.

## Electrical Systems Engineering/ESE

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**520-5 Circuit Analysis I**

Basic circuit theory course. Topics include component laws, network topology, node and mesh analysis, computer solution techniques, and sinusoidal steady-state analysis. Emphasis on linearity and on the interrelationship between the frequency and time domains. 4 hours lecture, 2 hours lab. Prerequisite: CS 142 or 210, MTH 233. Corequisite: PHY 242. (Previously listed as EGR 520.)

**521-4 Linear Systems I**

Considers systems in a broad context including linear, nonlinear; variant, invariant; and analog and discrete. Approaches to system and signal modeling are discussed with emphasis on the Fourier transform technique. Prerequisite: ESE 520. (Previously listed as EGR 521.)

**522-3 Linear Systems II**

Extends techniques of ESE 521. Introduces convolution and emphasizes the relationship between convolution, the system function, and the differential equation description. Develops the Laplace and z-Transform techniques and provides an introduction to digital filter theory. (Prerequisite: ESE 521 or permission of instructor. (Previously listed as EGR 522.)

**523-4.5 Discrete Systems**

Extends the techniques of ESE 521 and 522 to discrete time systems. Systems description using difference equations, transfer functions, singularity function response, and pole zero locations. System response using classical difference equation solutions, discrete convolution, and z-Transform methods; stability. Frequency response, discrete and fast Fourier transforms, digital filter synthesis. 3 hours lecture, 3 hours lab. Prerequisite: ESE 322 (522). (Previously listed as EGR 523.)

**524-3 Circuit Analysis II**

Continuation of Circuit Analysis I course. Topics include operational amplifier circuits; mutual inductances and transformers; steady-state power calculations and power factor; balance 3- $\phi$  circuits; series and parallel resonance and filters; and two-port circuits. Prerequisite: ESE 520.

**527-3.5 Introduction to Analog Systems**

Electrical and mechanical analog computing components, time and amplitude scaling, and simulation techniques. 2 hours lecture, 3 hours lab. Prerequisite: ESE 521 or permission of instructor. (Previously listed as EGR 527.)

**541-4.5 Electronic Devices**

Introductory study of basic solid-state and electron devices. Includes fundamentals necessary for comprehension and further study of modern engineering electronics. Topics include carrier flow in semiconductors, p-n junction theory, semiconductor diodes, bipolar junction transistors, field effect transistors, biasing, and introduction to amplifiers. 3 hours lecture, 3 hours lab. Prerequisite: ESE 520. (Previously listed as EGR 541.)

**545-4 Electromagnetics**

Developments in the basic concepts of vector calculus and their application to electromagnetics, electrostatics, and magnetism; induced electromotive force; and Maxwell's equations and their physical interpretation and application. Prerequisite: ESE 520, MTH 232. (Previously listed as EGR 545.)



**546-3 to 4 Transmission Lines, Waveguides, and Radiating Systems**

Plane waves in free space and matter, development of the transmission line equations, and application of Smith charts. Application of Maxwell's equations to the rectangular and circular waveguides. Introduction to radiating systems including the dipole and loop antennae; actual design of typical systems containing transmission lines, waveguides, and antennae. Prerequisite: ESE 545. (Previously listed as EGR 546.)

**551-4 Switching Theory and Circuits**

Switching algebra and switching functions, logical design of combinational and sequential switching circuits using integrated circuits. 3 hours lecture, 2 hours lab. (Previously listed as EGR 551.)

**605-5 Applied Electronics**

Study of application of modern electronic fundamentals for use in instrumentation and data handling, principally using integrated circuits. Sequence of topics: useful circuit laws, transistor switches, flip-flops, ideal linear voltage amplifiers, operational amplifiers, feedback amplifiers, and measuring instruments. 3 hours lecture or independent study, 4 hours lab. Prerequisite: ESE 520. (Previously listed as EGR 605.)

**621-4 Communication Theory**

The analysis of linear systems by the Fourier transform and the time convolution integral methods. Introduction to information theory. Comparative evaluation of various analog and pulse modulation techniques. Selected topics from radar theory and electro-optics as well as an introduction to random process theory. Prerequisite: ESE 522, STT 363 or equivalent. (Previously listed as EGR 621.)

**625-4 Control Systems I**

(Listed jointly with BMS 702.) Introduction to control systems using state variables and classical analysis. Closed loop system representation, block diagrams, time response, and frequency response are treated. 3 hours lecture, 2 hours lab. Prerequisite: ESE 321. (Previously listed as EGR 625.)

**626-4 Control Systems II**

(Listed jointly with BMS 703.) System stability and closed loop response are analyzed using Routh-Hurwitz, Nyquist, and root locus techniques. System specifications and compensation are realized using state variables and classical analysis. 3 hours lecture, 2 hours lab. Prerequisite: ESE 322, 625. (Previously listed as EGR 626.)

**627-4 Digital Control Systems**

Sampled spectra and aliasing, design of digital control systems using transform techniques and state-space methods, discrete equivalents to continuous transfer functions, and quantization effects. 3 hours lecture, 2 hours lab. Prerequisite: ESE 626, CEG 411 or equivalent. (Previously listed as EGR 627.)

**630-4 Distributed Systems**

Distributed constants and traveling waves in various types of physical systems. A-C steady-state in distributed systems. Phase and group velocities. Reflections, standing wave ratios, and impedance matching techniques. Prerequisite: ESE 322, MTH 232. (Previously listed as EGR 630.)

**633-4 Reliability Analysis**

Elements of probability theory: events, probability axioms, random variables, discrete and continuous distributions, moments, and characteristic functions. Applications of mathematical tools: component and system failure models. Marginal failures: initial tolerances, environmental drifts, transfer functions, and sensitivities. Passive and active redundancy techniques. Repairable systems: maintainability, availability, and reliability acceptance. Prerequisite: ESE 522. (Previously listed as EGR 633.)

**635-3 Network Synthesis and Design**

Active and passive network analysis; network functions and their realizability; introductory filter concepts and the approximation problem; passive network synthesis; and basics of active filter synthesis. Prerequisite: ESE 522, 621. (Previously listed as EGR 635.)

**641-4.5 Electronic Circuits**

Theory and application to basic engineering electronics developed for discrete and integrated circuits. Topics include bipolar and field effect transistor amplifier analysis and design, frequency response, and multi-stage and feedback amplifiers. 3 hours lecture, 3 hours lab. Prerequisite: ESE 541. (Previously listed as EGR 641.)

**644-4 Linear Integrated Circuits**

Theory and applications of linear integrated circuits. Topics include ideal and real operational amplifiers, frequency response and compensation, active filters, comparators, and waveform generators. 3 hours lecture, 2 hours lab. Prerequisite: ESE 641. (Previously listed as EGR 644.)



**649-4 Pulse and Digital Circuits**

Design and analysis of pulse and switching circuits including linear wave shaping; diode wave shaping; logic types, DTL, DCTL, RTL, TTL, and ECL; bistable, astable, and monostable multivibrators; voltage comparators; Schmitt triggers; blocking oscillators; and magnetic core switching. 3 hours lecture, 3 hours lab. Prerequisite: ESE 641. (Previously listed as EGR 649.)

**651-4 Digital Systems Design**

(Listed jointly with CEG 560.) Design of digital systems. Topics include digital arithmetic, register-level design, memory devices and their logic, and controller and processor design. 3 hours lecture, 2 hours lab. Prerequisite: ESE 551. (Previously listed as EGR 651.)

**654-4 VLSI Design**

(Listed jointly with CEG 654.) Introduction to VLSI system design. Topics include NMOS devices and circuit design techniques, basic building blocks for NMOS design, fabrication processing and design rules, chip planning and layout, system timing and power dissipation, simulation for VLSI design, and signal processing with VLSI. Prerequisite: ESE 641, 651. (Previously listed as EGR 654.)

**656-4 Introduction to Robotics**

(Listed jointly with CEG 656 and MSE 656.) Introduction to the mathematics, programming, and control of robots. Topics include coordinate systems and transformations, kinematic equations, trajectory planning, dynamics, control, programming, and computer vision. Prerequisite: MTH 233. (Previously listed as EGR 656.)

**673-4 Communication Systems Design I**

Introduction to communication systems design. Topics include source characterization and encoding, choice of modems and the tradeoffs involved, and choice of received configuration. Techniques developed are applied in the design of a deep space communication system. Prerequisite: ESE 522, 621, or permission of instructor. (Previously listed as EGR 670.)

**674-3 Communication Systems Design II**

Completes the communication system design sequence and provides the support necessary to complete the ESE 673 design project. Topics include multi-level modems, coding, equalization, and link design. Prerequisite: ESE 673.

**675-3 Introduction to Radar Systems**

Introductory study of the radar equation, antenna patterns, target cross sections and system losses, radar measurements, pulse doppler and coherent techniques, detection probability and signal-to-noise ratio, sidelobe clutter, synthetic arrays, and pulse compression techniques. Prerequisite: ESE 522. (Previously listed as EGR 675.)

**699-1 to 5 Special Problems in Engineering**

(Listed jointly with BME 699, EGR 699, and MSE 699.) Special problems in advanced engineering topics. Titles vary.

**700-3 Principles of Instruction in Engineering**

(Listed jointly with BME 700 and MSE 700.) Survey of available instructional materials and discussion of educational theories and techniques leading to more effective instruction. For first-year graduate teaching assistants only. (Previously listed as EGR 700.)

**701-3 Linear Systems I**

(Listed jointly with BMS 705.) Signal representation. Orthogonal families of signals and generalized Fourier series. Generalized functions, the impulse function. Calculus of generalized functions. Superposition and convolution of signals. The Fourier transform. Sampled and periodic signals and their associated spectra. Fast Fourier transform. Time-limited and band-limited signals—sampling theorems, uncertainty principle. Prerequisite: ESE 521, 522. (Previously listed as EGR 701.)

**702-3 Linear Systems II**

(Listed jointly with BMS 706.) Differential equation description of a linear system; degenerate and nondegenerate systems; decomposition of an  $n$ th order linear system; state equations; transition matrix; and input/output relations. (Previously listed as EGR 702.)

**710-3 Digital Signal Processing**

(Listed jointly with BMS 708.) Difference equations and solutions.  $z$ , discrete Fourier, and fast Fourier transforms. System stability, frequency response, and signal flow graph realizations. Simulation of continuous systems and FIR/IIR digital filter design. High speed correlation, convolution, and spectral estimation methods. Prerequisite: ESE 701. (Previously listed as EGR 710.)

**711-3 Multidimensional Digital Signal Processing**

Topics of ESE 710 extended to multidimensional systems and signals. Provides the theoretical and applied basis for analysis and synthesis of discrete systems and operations used in digitally processing images, outputs of transducer arrays, and other multidimensional signals. Prerequisite: ESE 710. (Previously listed as EGR 711.)



**715-4 Imaging Systems**

Introduction to optical imaging systems using techniques of linear system theory. Classical topics of scalar diffraction, incoherent/coherent imaging, and lens theory developed in terms of convolution integral and two-dimensional Fourier transform. Optical system synthesis also introduced using linear system formulation. Spatial filtering, optical information processing, and holographic imaging considered. Prerequisite: ESE 702 or permission of instructor. (Previously listed as EGR 715.)

**720-3 Sampled-Data Control Systems**

Frequency analysis of hybrid systems; multirate sampled-data control systems; sampled-data system with nonsynchronized sampler; stability criteria; and conventional analysis and design of sampled-data control systems. Prerequisite: ESE 523 or 702. (Previously listed as EGR 720.)

**724-3 Foundations of Optimization Theory**

Theory of minima and maxima, calculus of variations, optimum-seeking search techniques, dynamic programming, and maximum principle. Prerequisite: ESE 702. (Previously listed as EGR 724.)

**725-3 Principles of Modern Control Theory**

Calculus of variations for continuous processes. Euler-Lagrange equations and the use of Lagrange multipliers; Pontryagin's maximum principle, Hamilton-Jacobi theory; and application to control examples. Prerequisite: ESE 426 and 702. ESE 702 may be taken concurrently. (Previously listed as EGR 725.)

**726-3 Computational Techniques of Modern Control Theory**

Continuation of ESE 725 emphasizing search techniques, state estimation, and the Linear-Quadratic-Gaussian problem. Prerequisite: ESE 725. (Previously listed as EGR 726.)

**733-4 Modern Radar Theory**

Application of probability and random process to the performance characterization of range/doppler radar. Development of the concepts of resolution, S/N, ambiguity function, and pulse compression, and their applications to radar systems design. Consideration is also given to coherent imaging radar. Completion of courses in probability theory, linear systems, or permission of instructor required. (Previously listed as EGR 733.)

**740-4 Information and Coding Theory**

Development of communication channel model and use of information theory as means of quantifying that model. Investigation of various error correcting and detecting codes. The popular Viterbi coding algorithm is also considered. Completion of courses in basic linear systems and probability theory or permission of instructor required. (Previously listed as EGR 740.)

**745-4 Synchronous Communication Theory**

Investigation of various digital modems; consideration of TDMA, FDMA, and CDMA multiple access techniques; coherent and differential transmission techniques; carrier, frame, and bit synchronization techniques; convolution codes and the Viterbi decoder; and baseband encoding techniques. Introduction to spread spectrum. Completion of courses in basic linear system and probability theory or permission of instructor required. (Previously listed as EGR 745.)

**750-3 Switching and Finite Automata Theory I**

Analysis and synthesis of finite state systems including definition and representation of finite automata and sequential machines; state transition diagrams and state table; machine realization using flip flops and delay lines; races and hazards in sequential circuits; equivalence of states and machines; incompletely specified machines; reduced machines; and asynchronous machines. Prerequisite: ESE 551. (Previously listed as EGR 750.)

**751-3 Switching and Finite Automata Theory II**

Further development of the theory of finite state systems: state assignment problems; partitions with SP and partition pairs; machine decomposition problem; regular expressions; linear machines; memory and information-losslessness; diagnosing and homing experiments; and control and identification problems. Prerequisite: ESE 750. (Previously listed as EGR 751.)

**752-4 VLSI**

(Listed jointly with CEG 752.) Introduction to the techniques, limitations, and problems in the design of VLSI. Topics include NMOS, CMOS technologies, design rules, chip planning, layout, testability, and simulation. Prerequisite: ESE 451; ESE 710 or CEG 720. (Previously listed as EGR 752.)

**753-4 VLSI II**

(Listed jointly with CEG 753.) Continuation of ESE 752 with a more detailed study of lecture topics and testing and evaluation of chips implemented in ESE 752. Prerequisite: ESE 752. (Previously listed as EGR 753.)

**756-4 Robotics**

(Listed jointly with CEG 756 and MSE 756.) Detailed study of the dynamics and control of robotic systems. Includes trajectory planning, rigid-body dynamics, rotating coordinate systems, and computer implementation of various adaptive and optimal control schemes. Prerequisite: ESE 656, CEG 611, ESE 627 or 720. (Previously listed as EGR 756.)



**757-4 Robotics II**

(Listed jointly with CEG 757 and MSE 757.)  
Studies programming and vision techniques applicable to the control of robotic systems. Includes robot languages, teach mode, image processing, scene analysis, and pattern recognition. Prerequisite: ESE 756. (Previously listed as EGR 757.)

**761-3 Analytical Techniques of Stochastic Analysis**

Topics of engineering relevance from probability and statistics; introduces discrete and continuous random processes; Markov modeling of physical systems; real-time estimation of power spectral density and covariance functions; and input/output relationships for discrete and continuous linear stochastic systems. Discussion of maximum likelihood estimation with application to the single and multiple parameter case. Completion of course in basic linear systems required. (Previously listed as EGR 761.)

**762-3 Estimation, Identification, and Optimal Filter Theory**

Definition of the linear minimum mean-squared estimator. Derivation of the discrete Kalman filter equations; stability of the Kalman filter; Kalman filter configurations when employed as a fixed point and fixed lag smoother, predictor, and S/N enhancer; and modification of the Kalman filter equations to provide system parameter identification. Nonlinear filtering and the extended Kalman filter. Introduction of the innovations representation and its extension to the adaptive Kalman filter. Development of the continuous Kalman filter and a detailed comparison with the Levinson and Weiner stationary filters. Prerequisite: ESE 761. (Previously listed as EGR 762.)

**763-3 Applications of Estimation, Identification, and Filter Theory**

System model errors; filter divergence and data saturation; the information filter sequential processing, and square root filtering; suboptimal filter design and sensitivity analysis; and computer implementation considerations. Selected problems from control theory, communications, navigation, and image processing. Prerequisite: ESE 762. (Previously listed as EGR 763.)

**830-3 Nonlinear Systems**

Nonlinear elements and their effects in physical systems, phase plan, linearization techniques, describing functions, Liapunov stability, absolute stability, and Popov's theorem. (Previously listed as EGR 830.)

**880-3 Selected Topics in Systems Engineering**

(Listed jointly with BME 880 and MSE 880.)  
Selected topics in current research and recent developments in systems theory and engineering. (Previously listed as EGR 880.)

**890-1 to 5 Special Problems**

(Listed jointly with BME 890, EGR 890, and MSE 890.) Special problems in advanced engineering topics. Titles vary.

**899-1 to 5 Thesis**

(Listed jointly with BME 899, EGR 899, and MSE 899.)

**Engineering/EGR**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements or special course information.

**699-1 to 5 Special Problems in Engineering**

(Listed jointly with BME 699, ESE 699, and MSE 699.) Special problems in advanced engineering topics. Titles vary.

**890-1 to 5 Special Problems**

(Listed jointly with BME 890, ESE 890, and MSE 890.) Special problems in advanced engineering topics. Titles vary.

**899-1 to 5 Thesis**

(Listed jointly with BME 899, ESE 899, and MSE 899.)

**English/ENG**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**530-3 Business Writing**

Techniques in business writing with emphasis on improving mechanical skills, reviewing forms of business writing, and analyzing business and technical prose.

**533-4 Fundamentals of Technical Writing**

Basics of technical writing with emphasis on descriptive techniques, audience analysis, and report writing.

**543-4 Advanced Composition**

Refinement of style. Emphasis on sophisticated techniques of expository writing.

**544-4 Research Writing**

Instruction in organization, documentation, and writing of research papers. Research projects based not only on primary and secondary sources but also on experiment and investigation.

**610-4 Studies in English Literary History**

Provides intensive study of English literature from the point of view of literary history. Develops an understanding of the historical approach to literature and an ability to deal critically with historical generalizations about literary periods and movements. Titles vary.



**620-4 Studies in American Literary History**

Provides intensive study of American literature from the point of view of literary history. Develops an understanding of the historical approach to literature and an ability to deal critically with historical generalizations about literary periods and movements. Titles vary.

**630-4 Studies in Major English Writers**

Provides intensive study of the work of a single major English author—such as Shakespeare, Chaucer, Milton, and others—and develops an understanding of individual works of literature in the context of an author's life and total literary production. Titles vary.

**640-4 Studies in Major American Writers**

Provides intensive study of the work of a single major American author—such as Melville, Whitman, James, and others—and develops an understanding of individual works of literature in the context of an author's life and total literary production. Titles vary.

**650-4 Studies in Literary Types and Modes**

Provides intensive study of important literary forms such as poetry, the novel, comedy, tragedy, satire, and the epic. Develops an understanding of the formal aspects of literature as approached theoretically, analytically, or historically. Titles vary.

**654-4 Feature Story Writing**

(Listed jointly with COM 654.) Includes finding, writing, polishing, and marketing feature material.

**658-4 Editing for the Media**

(Listed jointly with COM 658.) Editing copy for mass media with emphasis on newspaper format, headline writing, rewriting, and general copy desk.

**660-4 Studies in Literary Themes**

(Listed jointly with REL 610.) Provides intensive study of literary works in terms of significant and recurring literary themes as they can be traced in various eras, cultures, and literary traditions. Titles vary.

**670-4 Studies in Literary Criticism**

Provides intensive study of the theoretical, practical, and historical aspects of literary criticism in order to develop an understanding of important critical questions and approaches. Titles vary.

**677-1 to 6 Workshop**

Intensive study of selected special topics or problems designed to meet the needs of participating students. Titles vary.

**678-4 Introduction to Linguistics**

Survey of major branches of English linguistics; present-day phonology, morphology, and syntax and their historical development; and social and psychological approaches to language.

**679-4 History of the English Language**

Study of the ancestry and early growth of English, the history of English sounds and inflections, the development of the English vocabulary, and variations in pronunciation and usage in Modern British and American English. Prerequisite: ENG 101, 102.

**680-4 Studies in Linguistics**

Provides intensive study of the English language and linguistics, and develops an understanding of the historical, comparative, and descriptive approaches to the study of language and of the nature and value of their findings.

**690-4 Studies in World Literature**

Provides study in English of non-European literature, focused nationally, regionally, cross-culturally, thematically, or generically (e.g., Caribbean Fiction, Modern Japanese Literature, and Commonwealth Literature).

**694-4 Creative Writing Seminar**

Writing fiction and/or poetry, group discussion of manuscripts, and special assignments in technique, related criticism, and contemporary professional writing. Students must submit a sample of their work before registering.

**700-1 Seminar in Teaching College Composition**

In-service training in teaching college-level composition. Includes instruction, discussion, observation, and evaluation. For first-year graduate assistants only.

**701-4 Methods and Materials of Research**

Examination of the aims and approaches of scholarly study and the tools and methods of research. Emphasis on the problems of collecting, evaluating, and reporting the findings of scholarly study.

**702-4 History of Literary Criticism**

Survey of major critical documents from ancient times to the present.

**707-4 The Nature of Language**

Consideration of the sources and processes of language and its relationship to thought, imagination, and symbolic form. Emphasis on the contributions of anthropology, linguistics, philosophy, psychology, and sociology to our understanding of language.

**710-4 The Creative Process**

Survey of the theoretical and practical aspects of literary creativity including such considerations as the creative imagination and writers' practice of their craft. Includes practice in the creation of original work.

**711-4 Rhetoric**

Introduction to rhetoric as related to the written word, to the history of rhetoric, to current rhetorical theory, and to the application of rhetorical theory and method of the study of literature and composition.



**712-4 Style in Writing**

Introduction to the theoretical and practical study of style in writing, with emphasis on the development of English prose style and practice in stylistic analysis.

**716-4 The Study of Literature**

Current approaches to the study of literature in the classroom. Topics include literary types, analysis, evaluation, and the relationship of literature to other disciplines.

**717-4 The Study of Writing**

Current approaches to the study of composition in the classroom. Topics include rhetoric, usage, stylistics, and the analysis and evaluation of student writing.

**718-4 The Study of Professional Writing**

Current approaches to the study of technical, business, and other specialized writing. Critical and historical analyses are supplemented by assignments in writing the studied forms.

**720-4 Women's Studies Through Literature**

Current approaches to the study of literature by and about women. Includes introduction to feminist criticism and examples of its application to texts.

**730-4 Seminar in Major Writers**

Reading, research, reports, and discussion on topics dealing with a single writer or two closely related ones (e.g., Chaucer, Melville, Joyce, or Wordsworth and Coleridge). Prerequisite: ENG 701.

**740-4 Seminar in Literary Genres**

Reading, research, reports, and discussion on topics dealing with a single literary genre (e.g., epic, novel, tragedy, lyric poetry, or historical drama). Prerequisite: ENG 701.

**750-4 Seminar in Cultural Periods**

Reading, research, reports, and discussion of topics dealing with the literature and culture of particular historical periods or with literary movements (e.g., the Middle Ages, the age of Johnson, romanticism, or the twenties). Prerequisite: ENG 701.

**760-4 Seminar in Special Literary Problems**

Reading, research, reports, and discussion on topics dealing with special problems such as literary themes, literary conventions, literature in relation to other disciplines, literary backgrounds, critical approaches, and interdisciplinary study. Prerequisite: ENG 701.

**770-4 Seminar in the English Language**

Reading, research, reports, and discussion on topics dealing with historical linguistics (e.g., Old English or Middle English) or modern grammar (e.g., generative phonology, theory of syntax, or dialectology). Prerequisite: ENG 680 or 707, 701.

**791-1 to 4 Independent Study**

Faculty-directed independent study in literature or language usually requiring reports and conferences with the instructor.

**795-4 to 8 Internship and Apprenticeship**

Supervised college-level teaching, archival work, or professional writing. Graded pass/unsatisfactory.

**799-4 to 8 Thesis****Environmental Studies/ENV**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**620-1 to 6 Workshop in Environmental Studies**

Intensive study of a selected aspect of environmental issues designed to meet the needs of participants according to advance announcements. Titles vary.

**Finance/FIN**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**621-3 Graduate Survey in Financial Management**

Theories, concepts, and techniques of financial management. Designed for students with no previous course work in financial management and for those with a need to review basic concepts prior to taking an advanced finance course. Prerequisite: ACC 622

**702-3 Financial Institutions and Markets**

In-depth analysis of the operational aspects of financial institutions and financial markets. Emphasis on policy formulation and decision making. Prerequisite: EC 717, FIN 621.

**710-3 Investment Management**

Concepts, theories, and techniques underlying the development of investment policies and strategies. Prerequisite: FIN 621.

**711-3 Seminar in Investments**

Advanced treatment of selected topics in investments including options, futures, and portfolio theory. Prerequisite: FIN 710.

**720-3 Bank Management**

Advanced treatment of issues relating to the financial management of commercial banks. Prerequisite: FIN 702, 741.

**722-3 Risk Management and Insurance**

Theory and practice of personal and corporate risk management with emphasis on the appropriate use of insurance. Prerequisite: FIN 621.



**731-3 Real Estate Investment Analysis**

Theory and practice of investing in real property. Topics include cash flow, valuation, risk and return analysis, taxes, and real estate financing. Extensive use of cases. Prerequisite: FIN 621.

**741-3 Financial Management**

Application of financial management principles, concepts, theories, and techniques. Emphasis on case problems and decision making. Prerequisite: FIN 621.

**742-3 Seminar in Financial Theory**

Advanced treatment of theoretical issues in finance. Topics include capital structure, options, agency theory, capital budgeting, and other long-term finance issues. Extensive use of outside readings. Prerequisite: FIN 741.

**743-3 Seminar in Working Capital Management**

Advanced treatment of the theory and practice of working capital management, including cash management, credit policy, inventory policy, and short-term financing strategies. Extensive use of outside readings. Prerequisite: FIN 741.

**750-3 Financial Management of Health Service Organizations**

Overview of the financial management function in health care organizations. Topics include budgeting, control, capital expenditure analysis, and rate settings. Prerequisite: FIN 621.

**760-3 Special Topics in Finance**

In-depth analysis of a current trend in finance. Prerequisite: FIN 741 and permission of instructor.

**780-6 Finance Internship**

One-quarter internship in a selected private or governmental organization under the direction of a faculty adviser and employment supervisor.

**781-1 to 3 Special Studies in Finance**

Intensive reading or research in a selected field of advanced finance.

**790-3 Seminar in International Financial Management**

Advanced treatment of the concepts and techniques of international financial management. Prerequisite: FIN 741.

**799-1 to 9 Thesis****French/FR**

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**590-8 Foreign Language Institute**

For teachers of French. Intensive experience designed, through total immersion, to improve language skills (conversation and composition) and to increase awareness of French civilization and contemporary culture.

**603-4 Advanced Studies: Language/Civilization**  
Conducted in French. Topics vary.**622-4 Villon to Chénier**

Three centuries of French poetry: Villon, Scève, Marot, du Bellay, Ronsard, d'Aubigné, Malherbe, La Fontaine, Boileau, Voltaire, and Chénier.

**641-4 Libertines and Moralists: Rabelais to Voltaire**

Currents of skepticism and humanism in the intellectual history of France. Major authors: Rabelais, Montaigne, Cyrano de Bergerac, Saint-Evremond, La Bruyère, La Rochefoucauld, Bayle, Fontenelle, Diderot, and Voltaire.

**642-4 Seventeenth- and Eighteenth-Century Theatre**

Works of Corneille, Molière, Racine, Marivaux, Diderot, Voltaire, and Beaumarchais.

**643-4 The Enlightenment**

History of political and social ideas in eighteenth-century France. Based principally on works of Montesquieu, Diderot, Voltaire, and Rousseau.

**650-1 to 4 Independent Graduate Research**

Titles vary.

**651-4 French Romanticism**

From Rousseau to Hugo. Includes Bernardin de Saint-Pierre, Chateaubriand, Mme de Staël, Nodier, Lamartine, Vigny, Musset, and Nerval.

**652-4 The Nineteenth-Century Novel**

Chateaubriand, Constant, Stendhal, Balzac, Flaubert, Zola, and France.

**653-4 Poetry from Baudelaire to Breton**

Symbolists, Decadents, and Surrealists.

**662-4 Twentieth-Century Literature**

The novel.

**663-4 Twentieth-Century Literature: Drama**

Study of modern French theatre, including Cocteau, Giraudoux, Anouilh, Beckett, and Ionesco.

**665-4 Problems in French Literature**

Examination of selected topics in French literature to investigate various themes, myths, genres, literary movements, or characters. Titles vary.

**681-4, 682-4 Independent Reading for Graduate Students**

Titles vary.

**Geography/GEO**

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**503-4 Space and Faith: Topics in Religion and Geography**

The interrelation of religious and geographical factors in selected cultures of East and South Asia. Titles vary.



**531-4 Meteorology**

Development and application of first principles governing the atmosphere at rest and in motion. Examination of the general circulation. Applied meteorology. Prerequisite: MTH 131.

**534-4 Climatology for Earth Science Teachers**

Interaction of weather and climate with the various earth systems. Includes observation, measurement, and analysis of meteorological elements and controls.

**560-4 Systematic Geography**

Analysis of various geographic factors. Topics vary.

**570-3 Regional Geography**

Physical and cultural analysis of major and minor world regions. Topics vary.

**599-1 to 4 Studies in Selected Subjects**

Problems, approaches, and topics in the field of geography. Topics vary.

**612-4 Urban Planning II: Principles of Planning**

Includes the role of planning in urban structures, and duties and responsibilities of planning commissions; process of preparing comprehensive plans; population change, the economic base, and employment change; and of future urban structure. (Previously listed as GEO 676.)

**613-4 Urban Planning III: The Land Use Plan**

The process of preparing comprehensive urban plans. Methods for assessing land-use conditions, housing patterns, and urban deterioration. Students participate in the development of a land-use plan for a selected area. Prerequisite: GEO 612 or permission of instructor. (Previously listed as GEO 677.)

**614-4 Urban Planning Seminar**

Examination of urban plans and planning proposals. Includes future land-use plans, community facilities and public utility plans, and traffic and circulation plans. Considers modern theories of planning and the planning and design of new communities. (Previously listed as GEO 678.)

**632-4 Climatology II**

Principles of physical and dynamical climatology. Evaluation of local and regional transports and conversions of energy in the earth-atmosphere system. Prerequisite: GEO 531.

**645-5 Intermediate Cartography and Map Interpretation**

Study and practice of compilation processes for the development of maps and models using remotely sensed data sources. 4 hours lecture, 1 hour lab.

**646-4 Map and Photo Interpretation**

Uses of map and photographic data in close and long range photogrammetry. Emphasis on the full spectrum of photo interpretation as applied to the controlled mapping of terrestrial and marine surfaces. Prerequisite: GEO 645 or permission of instructor.

**647-5 Geographic Information Systems**

Principles, structures, and applications of geographic information systems and use of data from topographic, remotely sensed, and photogrammetric sources. Prerequisite: GEO 365 or permission of instructor.

**655-4 Geography of Transportation**

Analysis of spatial aspects and structural characteristics of transport networks, the movement of goods, and their relationship to regional structures.

**658-4 Human Perception in Resource Management**

Spatial factors influencing human response and decision making in resource use schema. How people perceive environmental elements and apprehend resources and natural hazards such as floods and droughts.

**662-4 Remote Sensing of the Environment**

Application of remote sensing techniques to environmental and resource problems. Emphasis on optimizing sensor selection to enhance image information content.

**663-4 Geographic Applications of Remotely Sensed Data**

Application of geographic methodology to problems employing photographic and machine-processed multispectral scanner data that are used in academic research, environmental analysis, and planning. Prerequisite: GEO 662 or permission of instructor.

**665-5 Cartography**

Principles of map projections and their construction and use in illustrating geographic relationships. Includes methods of design, compilation, and graphic representation of data. 4 hours lecture, 1 hour lab.

**666-4 Seminar in Urban Geography**

Geographic perspective in the study of cities. Recent developments in theory, method, and techniques in urban geographic research with emphasis on the behavioral approach.

**681-1 to 4, 682-1 to 4 Special Problems in Geography**

Research and problems designed for specific needs and talents of the students. Titles vary.

**684-3 to 4 Biogeography**

Introduction to factors affecting the geographical distribution of plants and animals. Students registering for GEO 684 for 3 credit hours attend lectures only; registration for GEO 684 for 4 credit hours requires an additional laboratory section.



**Geological Sciences/GL**

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**599-1 to 6 Special Problems**

Research and problems designed for specific needs and talents of the students.

**600-3 Introduction to Solid Earth Geophysics**

The basics of seismic, gravimetric, magnetic, and heat conduction principles as used to determine the geophysical properties of the solid earth. Emphasis on the deeper parts of the crust, the mantle, and the core.

**601-6 Crystallography and Optics**

Introduces symmetry of crystals and crystal optics. Determination of optical constants of crystals by use of the polarizing microscope. 3 hours lecture, 3 hours lab. (Previously listed as GL 501.)

**606-4.5, 607-4.5, 608-4.5 Earth Science for Teachers**

Sources and forms of energy operating on the earth and the effects of these operations on the origin, history, and evolution of the earth. 3 hours lecture, 3 hours lab. (Previously listed as GL 506, 507, and 508.)

**609-4 Environmental Geology**

Impact and interrelations of geologic processes on the quality of life and the works of humans. 3 hours lecture, 3 hours lab. (Previously listed as GL 509.)

**610-6 Mineralogy**

Chemistry and physics of minerals. Laboratory includes identification of minerals by microscopic, macroscopic, and X-ray techniques. 3 hours lecture, 6 hours lab. (Previously listed as GL 510.)

**611-4.5 Structural Geology**

Geometry of the structural features of rocks, their geographic distribution, and possible causes. 3 hours lecture, 3 hours lab. (Previously listed as GL 511.)

**612-6 Petrology**

Study of the origin of igneous, metamorphic, and sedimentary rocks. Thin sections of rocks are used in the laboratory for mineral identification, microscopic structures, and rock classification. 3 hours lecture, 6 hours lab.

**613-5 Geochemistry**

The principles governing the distribution of the elements within the earth. Introduction to geochemical methods of research. 3 hours lecture, 4 hours lab.

**614-3 Volcanology**

Study of volcanic processes and features found in volcanic areas.

**616-4.5 X-Ray Techniques**

Generation, spectrum, and absorption of X rays; diffraction of X rays on crystals; identification of crystals using powder cell dimensions of crystals; and solid solutions. 3 hours lecture, 3 hours lab.

**617-3 Theoretical Hydrology**

Introduction to mathematical and physical concepts in hydrology; equations of flow of ground water; mathematical modeling of boundary value problems in hydrology; and steady state and unsteady state behavior.

**618-4.5, 619-4.5 Igneous Petrology**

Study of the occurrence, chemical-geological features, and genesis of selected families of volcanic and plutonic rocks. Laboratory focuses on petrographic study of igneous rock suites. 3 hours lecture, 3 hours lab.

**620-3 Regional Tectonics**

Variations in regional tectonics style as determined by stratigraphy, structure, and geophysical measurements. Prerequisite: GL 311.

**621-3 Ground Water Law and Regulatory Principles**

A case study approach to understanding current federal, state, and local ground water laws and regulations.

**622-5 Introduction to Geophysical Prospecting**

Introduction to principles of gravity, magnetic, seismic, electrical, and radioactive prospecting. 3 hours lecture, 4 hours lab.

**623-4 Seismic Exploration**

Theory, observation, and analysis of seismic phenomena as applied to geologic exploration. 2 hours lecture, 4 hours lab. Prerequisite: GL 422 (622), or permission of instructor.

**624-4 Gravity and Magnetic Exploration**

Study of the theory of the earth's gravitational and magnetic fields and the application of these principles to resource exploration. 3 hours lecture, 2 hours lab. Prerequisite: GL 422 (622), or permission of instructor.

**625-4 Topical Concepts in Geophysics**

Special topics in geophysics. 3 hours lecture, 2 hours lab. Prerequisite: GL 400 (600), 422 (622), or permission of instructor.

**626-1 Geophysics Seminar**

Literature survey and student presentations on selected topics in geophysics. Graded pass/unsatisfactory. Prerequisite: GL 400 (600) or 422 (622).

**627-4 Regional Structural Synthesis**

The synthesis of diverse structural, geophysical, and remote sensing data and their application to regional tectonic interpretation and natural resource evaluation. 3 hours lecture, 2 hours lab. Prerequisite: GL 311 (611), 312 (643).



**628-0.5 Geology Seminar**

Selected geological topics discussed by students, guest speakers, and faculty.

**629-4 Sedimentology**

Clastic rocks, their mineralogy, texture, provenance, and classification; nonclastic carbonates and other nonclastic rocks; and depositional environments and sedimentary structures. 3 hours lecture, 2 hours lab. Completion of an undergraduate course in stratigraphy is required.

**630-4 Photogeology**

The use of aerial photographs in the interpretation of lithology, stratigraphy, and structures. The use and advantages of photoanalysis are covered. 3 hours lecture, 2 hours lab.

**632-4.5 Carbonate Petrology**

The character, composition, origin, and diagenesis of carbonate rocks are examined using ancient and modern examples. 3 hours lecture, 3 hours lab.

**633-4.5 Stratigraphy**

Principles, rules, and techniques of correlation. Relationships between surface and subsurface correlation. Geologic and geophysical correlation techniques are emphasized in the laboratory. 3 hours lecture, 3 hours lab. (Previously listed as GL 523.)

**634-9 Field Geology**

Geologic phenomena illustrated in the field. Introduction of mapping techniques and the application of many geologic disciplines to geologic analysis. (Previously listed as GL 534.)

**637-4 Seismic Data Processing**

Digital filtering, deconvolution, and migration of seismic data. 3 hours lecture, 2 hours lab. Prerequisite: GL 623.

**638-2 Seismic Interpretation**

Interpretation methods for seismic reflection data are studied with emphasis on structural and stratigraphic interpretation for petroleum traps. Prerequisite: GL 623 or permission of instructor.

**639-1 to 6 Applied Geophysics for Hydrology and Engineering**

Geophysical principles, field techniques, and interpretation methods are applied to geological problems in hydrology and engineering. Emphasis is on electrical resistivity and seismic refraction methods.

**640-3 Economic Geology**

Genesis, classification, and description of economic metal-bearing mineral deposits. Prerequisite: GL 412 (612) or 413 (613).

**641-4.5 Paleontology I**

Morphology, geologic record, and geographic distribution of major invertebrate groups characterized by significant fossil representation. 3 hours lecture, 3 hours lab. (Previously listed as GL 530.)

**642-4.5 Paleontology II**

Morphology, geologic record, and geographic distribution of major vertebrate and plant groups characterized by significant fossil representation. 3 hours lecture, 3 hours lab. (Previously listed as GL 531.)

**643-4 Advanced Structural Geology**

Development of the theory of rock behavior. Finite strain and gravity tectonics are discussed. 3 hours lecture, 2 hours lab. Prerequisite: GL 311.

**644-4 Formation Analysis**

The theory, application, and interpretation of geophysical logs with emphasis on their use in correlation and determining porosity, permeability, and fluid content of subsurface formations. 3 hours lecture, 2 hours lab.

**645-4 Geology of Earth Energy Resources**

The geology of natural energy sources with emphasis on fossil fuels, especially petroleum and gas. Also includes geothermal energy and radioactive ore deposits. Geological and geographic distribution, genesis, exploration, production, governmental controls, and economic aspects are covered. 3 hours lecture, 2 hours lab.

**648-4 Sedimentary Geochemistry**

The origin of sedimentary materials resulting from chemical processes. The structures of minerals in sedimentary materials (carbonates, clay) and their changes, with emphasis on properties and identification. 3 hours lecture, 2 hours lab. Prerequisite: GL 629.

**649-3 Evolution of Sedimentary Rocks**

A quantitative study of the sedimentary rock mass and the fluxes that supply and deplete it, and a review of mathematical models describing the sedimentary cycle. Prerequisite: GL 629.

**650-4 Hydrogeology**

Provides a fundamental understanding of basic hydrological principles including ground water flow and chemistry, surface water hydrology, unsaturated flow, and meteorology.

**651-3 Regional Hydrogeology**

Study of the hydrogeology of the United States including water balance, budget, and yield.



**652-3 Advanced Hydrogeology**

Second-level course in hydrogeology providing the theoretical background necessary to solve real-life problems involving ground water flow, well hydraulics, aquifer characterization, and contaminant transport. Prerequisite: GL 450 (650) and completion of a calculus course.

**653-3 Hydrogeochemistry**

Lectures focus on the types of chemical reactions that control the composition of ground water. Included are solubility, adsorption and ion exchange, redox reactions, and complexing. Computer programs for geochemical modeling are introduced. Prerequisite: GL 410, CHM 121, 122, and 141.

**656-4.5 Engineering Geology I**

Principles of engineering geology; application of geologic principles to engineering works. The impact and interrelationship of geologic processes on construction efforts. 3 hours lecture, 3 hours lab.

**657-4.5 Engineering Geology II**

Engineering geology case studies. Review of classic and unusual engineering geology projects chosen from both published and unpublished sources especially to illustrate principles, problems, and solutions. 3 hours lecture, 3 hours lab. Prerequisite: GL 656.

**658-3 Ground Water Management**

Introduces the basic principles of ground water management, including case studies.

**660-1 Seminar in Hydrogeology**

Explores current topics and contemporary research programs and ideas. Graded pass/unsatisfactory.

**663-4 Geologic Applications of Remote Sensing**

Familiarizes students with and trains them in the applications of remote sensors to general field geology and more explicitly to exploration (mineral and petroleum) geology. Emphasis is on the end product of the remote sensor. 3 hours lecture, 2 hours lab.

**665-3 Regional Geomorphology**

Distribution, position, and surface form of geologic regions of the United States; a study of the geologic structure that underlies them and the erosional processes that have modified their surface expressions. (Previously listed as GL 565.)

**674-3 X-Ray Spectral Analysis**

Electron microprobe and X-ray fluorescence analysis of rocks, minerals, and other substances are explained and demonstrated.

**695-3 Geochemical Prospecting**

Theory, techniques, and application of geochemistry to exploration for economic mineral deposits including hydrocarbons.

**698-3 Regional Geology**

Literature on the geology of a region is studied in seminars; between terms specific areas of the region are visited and examined in a field trip.

**699-1 to 6 Special Problems**

Research and problems designed for specific needs and talents of the students.

**700-3 Principles of Instruction in Geology**

A survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For graduate teaching assistants only.

**711-4 Chemical Geology**

Development of atomistic models consistent with laws of thermodynamics and application of these models to the solution of geochemical problems. Individual research projects are pursued in the laboratory. 3 hours lecture, 2 hours lab. Concurrent registration in physical chemistry required.

**714-3, 715-3 Nuclear Geochemistry**

Examination of the different types of atomic species and the reactions they undergo. The use of radioactive isotopes and of daughter isotopes produced to measure ages of geologic events and as geochemical tracers. The study of the distribution and formation of the different isotopes in the earth and the solar system. 2 hours lecture, 2 hours lab.

**740-4.5 Sedimentary Analysis**

Theories, techniques, and applications of microscopic, physical, statistical, and X-ray analyses of sedimentary rocks. 3 hours lecture, 3 hours lab.

**751-3 Ground Water Flow Modeling**

The first half of the course introduces the techniques used in constructing and applying mathematical models of ground water flow. The second half features the use of the USGS 3-D flow model. Prerequisite: GL 450 (650) and completion of courses in calculus and FORTRAN.

**754-3 Hydrogeochemical Modeling**

Introduces students to several computer programs that have been developed to aid in the understanding of ground water geochemistry. Includes programs for mass balancing, speciation, and ground water simulation. Prerequisite: GL 453 (653).

**759-2 Advanced Ground Water Management**

Study of ground water management case histories and special topics. Prerequisite: GL 650.

**760-1 to 3 Hydrogeology Research Seminar**

Advanced seminar that addresses current research and special topics in hydrogeology. May be taken for letter grade or pass/unsatisfactory. Prerequisite: GL 450 (650).



**762-4 Ground Water Exploration and Evaluation**

Exploration and delineation of aquifers; interpretation of hydrologic tests; and case studies. 3 hours lecture, 2 hours lab.

**799-1 to 6 Special Problems**

Titles vary. May be taken for letter grade or pass/unsatisfactory.

**898-3 to 9 Geologic Field Research**

Specific areas in a region are studied using a specific area of specialization in the geologic sciences. Data are collected under close supervision and analyzed independently. Formal report of results to be prepared. Field experience included.

**899-1 to 5 Thesis****German/GER**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**590-8 Foreign Language Institute**

For teachers of German. Intensive experience designed, through total immersion, to improve language skills (conversation and composition) and to increase awareness of German civilization and contemporary culture. Graded pass/unsatisfactory.

**603-4 Advanced Studies: Language/Civilization**

Topics vary. Conducted in German.

**616-4 German Literature of the Eighteenth Century: Goethe and Schiller**

Representative works of Goethe and Schiller.

**625-4 German Literature of the Nineteenth Century: Prose**

Representative works of Eichendorff, Hoffmann, Keller, Meyer, Storm, Fontane, and others.

**631-4 German Literature of the Twentieth Century: Prose**

Readings and reports in twentieth-century literature. Representative works of Hesse, Mann, Kafka, and others.

**632-4 German Literature of the Twentieth Century: Drama**

Readings and reports in twentieth-century literature. Representative works of Schnitzler, Hofmannsthal, Kaiser, Toller, Brecht, and others.

**650-1 to 4 Independent Graduate Research**

Titles vary.

**681-4, 682-4 Independent Reading for Graduate Students**

Titles vary.

**Health, Physical Education, and Recreation/HPR**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**630-1 to 3 Coaching Theory**

Theory, skills, strategies, and organization principles of coaching a particular sport. Sports include baseball, basketball, football, soccer, swimming, track and field, tennis, and volleyball. Prerequisite: HPR 101 in same sport.

**635-1 to 3 Officiating**

Rules and techniques of officiating a particular sport, including baseball, basketball, football, soccer, and volleyball. Prerequisite: HPR 101 in same sport.

**688-1 to 6 Independent Study**

Independent reading, writing, and/or reporting in an area related to health, physical education, or recreation.

**689-1 to 6 Workshop in Health, Physical Education, and Recreation**

Intensive study of content, curriculum, method, or materials designed to meet the needs of preservice and in-service professionals in health, physical education, and recreation. Titles vary.

**710-4 Physical Education for Children with Special Needs**

Assessing students with handicapping conditions, planning appropriate physical activities based on this assessment, and providing the activities described in the plan. Prerequisite: HPR 212 or equivalent.

**720-4 Motor Development and Acquisition of Motor Skills**

The relationship of motor learning and motor control processes in the development of human motor skills. Prerequisite: HPR 450 or equivalent.

**740-4 Administration of Interscholastic Athletics**

Ways of directing interscholastic athletic programs. Emphasis on personnel administration, program development, facility management, fiscal management, and winning community and professional support. Prerequisite: HPR 340 or equivalent.

**750-4 Scientific Foundations for Conditioning**

Topics include exercise training techniques, heart rate, blood pressure, ventilation, strength, flexibility, and body composition. Includes laboratory methods. Prerequisite: HPR 351 or equivalent.

**753-4 Assessment of Physical Activity**

Focuses on selection of measurement materials, techniques of test administration, and essential statistical methods for scientific evaluation. Prerequisite: HPR 455 or equivalent.



**760-4 Advanced Athletic Training Techniques**

Examination of trauma, contusions, hematoma, strains, sprains, fractures, open wounds, and dislocations. Prerequisite: HPR 460 or equivalent.

**780-5 Research in Physical Education**

Study of the research processes in physical education and the development of research projects in students' areas of interest. Prerequisite: HPR 455 or equivalent.

## History/HST

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**515-4 The History of France since the Old Regime**

History of France from the collapse of the Old Regime and the beginning of the French Revolution to the present. Focuses on political, ideological, and cultural factors.

**518-4 Modern Japan**

Focuses on the phenomenal success of Japan's modernization since the imperial restoration in 1868. Japanese expansionism and imperialism, and Japan's power as an example for non-Western areas embarking on modernization.

**535-4 Sports in American Life**

Survey of the development of American sports from colonial times to 1980, with emphasis on the social, political, and ideological forces that transformed folk games into commercial ventures.

**590-4, 591-4, 592-4 Medieval Western Europe**

From the decline of the Western Roman Empire to ca. 1300. Emphasis on Italy, Germany, and France. 590: 285-814. 591: 814-1100. 592: 1100-1350.

**605-4 Ancient History**

Selected problems in Roman history to the death of Constantine in A.D. 337.

**615-4 Early Modern European History**

Selected problems in European history from the decline of the Roman Empire through the Renaissance and Reformation. Titles vary.

**625-4 Modern European History**

Modern Europe from the Enlightenment to the present through a national (e.g., Germany), chronological (e.g., nineteenth century), or topical (e.g., socialism) approach. Titles vary.

**635-4 British History**

Examines particular periods of British history (e.g., modern Britain) or topics (e.g., British constitutional history). Titles vary.

**645-4 Middle Eastern History**

The Balkans and the Middle East from the Middle Ages to the present. Topics may include Byzantine history, the Crusades, and the Middle East today. Titles vary.

**655-4 Latin American History**

Selected Latin American nations (e.g., Mexico), particular topics (e.g., the Age of Dictators), and regions of current historical interest (e.g., Central America). Titles vary.

**665-4 Far Eastern History**

Examines various periods of Chinese history and the modern histories of other Asian nations (e.g., India) or regions (e.g., Southeast Asia).

**670-4 Colonial American History**

The colonial, Revolutionary, and early national periods of American history, and topics such as Puritanism or the origins of early American political thought.

**675-4 Nineteenth-Century United States History**

Examines distinct periods in the nineteenth century (e.g., Civil War and Reconstruction) and major topics such as slavery. Titles vary.

**680-4 Twentieth-Century United States History**

Particular stages of the twentieth-century American experience (e.g., the Progressive era) or selected topics (e.g., the civil rights movement).

**685-4 Special Topics in United States History**

Intensive analysis of topics drawn from the entire range of the American experience, such as religion, diplomacy, women, immigration, and urbanization. Titles vary.

**691-1 to 4 Independent Readings**

Faculty-directed readings in field of a student's choice.

**695-4 Comparative History**

Compares developments or movements in different parts of the world and/or different times in history. May compare revolutions, slave systems, religious movements, or other human experiences that transcend a particular time or place. Titles vary.

**698-4 Historiography**

Introduction to the work of representative historians and important theories of historical interpretation.

**700-4 Historical Methods**

Intensive training in the research methods and materials of history.

**701-4 Seminar in United States History to 1865**

**702-4 Seminar in United States History since 1865**

**703-4 Seminar in Ancient, Medieval, and Early Modern European History**

**704-4 Seminar in Modern European History**

**705-4 Seminar in Latin American History**

**706-4 Seminar in Far Eastern History**

**707-4 Seminar in African History**

**708-4 Seminar in History**

Topics vary.



**710-4 Introduction to Archives and Manuscripts**

Fundamental problems and techniques of managing a historical archive or manuscript collection.

**711-2 State and Local History: Its Nature and Practice**

Defines the nature of state and local history by seeking to determine and explain characteristics of units that distinguish them from national history.

**712-4 The Management and Interpretation of History Museums**

Prepares students for positions with historical organizations as preservation officers, editors of historical publications, and for conducting historical surveys.

**713-2 Advanced Problems in Historical Administration**

Prepares students for positions in historical societies and similar organizations that preserve, maintain, or interpret historical properties.

**714-2 Advanced Problems in Archival Work**

Major problems in archival work and manuscript curatorship. Prepares students for careers as manuscript librarians, archivists, oral historians, and records management specialists. Prerequisite: HST 710.

**715-5 Historical Management Internship**

Gives Plan C students a 300-clock-hour internship in cooperating historical agencies. Practical training in various aspects of historical management. Reports to be written by students on the internship experience. Graded pass/unsatisfactory. Prerequisite: HST 710, 711, 712, 713, and 714.

**716-4 Introduction to American Architectural History: Preservation**

Provides the necessary foundation in American architectural history for supervision of, or participation in, the preservation program of a historical organization.

**717-1 to 2 Practica: Archives and Museums**

Archivists' and preservationists' techniques. Titles vary. Graded pass/unsatisfactory.

**718-4 Oral History Techniques**

The study of oral history techniques and methodology.

**719-4 Practice of Oral History**

Development of skill in the practice of oral history by means of intensive work in carrying out an oral history project. Field experience included. Prerequisite: HST 718.

**799-4 to 8 Thesis****Humanities/HUM**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**701-5 Worldviews and Worldways I**

Introduction to humanities study. A cross-cultural survey of major ways to view the world and the human situation. Exploration of key methods for studying these human constructions within the worldview they exemplify. Prerequisite: ENG 701 or HST 700.

**702-5 Worldviews and Worldways II**

Introduction to humanities study. Examination of one specific culture in light of its fundamental systems for giving meaning to the world and human life. Employs various methodological tools to explore the culture. Prerequisite: HUM 701.

**703-2 to 9 Humanities Project**

Individual project with an adviser

**799-1 to 4 Directed Studies**

Individual study in the humanities under the direction of a faculty supervisor. Scope of project must be outlined in advance. Titles vary.

**Law/LAW**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**611-3 Graduate Survey of Law and the Legal Environment**

Survey course in law and legal systems for students having had no previous course work in law and legal systems. (Previously listed as ADM 61.)

**680-3 Special Topics in Business and Government**

Deals with current problems of interest and value in the area of business. Topics include government regulation of business, social responsibility of business, and legal problems in business. (Previously listed as ADM 680.)

**695-3 Ethics of an Industrial Society**

(Listed jointly with REL 619.) Investigates the ethical responsibilities of business in light of political, moral, and religious considerations. Emphasizes the analysis and evaluation of the changing framework of responsibilities facing both business organizations and their leaders. (Previously listed as ADM 695.)



**710-3 The Corporation in the American Legal Environment**

Relationship between the corporation and society; development of American corporations, legal aspects of corporate forms of business, formations and operations, proposals for change of corporate governance, agency law, and security regulations. Not open to students with credit for LAW 360 or equivalent.

Prerequisite: LAW 611 or equivalent. (Previously listed as ADM 710.)

**715-3 Public Regulation of Business**

Methods and rationale of such topics as interface between government and public institutions; monopoly controls; consumer and employee protection. Prerequisite: LAW 611 or equivalent. (Previously listed as ADM 715.)

**770-4 Law, Ethics, and Social Environment**

Investigates the technical, governmental, and legal policy responsibilities of business in light of political, moral, social, and jurisprudential considerations. Presents certain fundamental issues concerning the nature of society, enabling students to better analyze and deal with these issues, both as a citizen and as an administrator. (Previously listed as ADM 770.)

**781-1 to 3 Special Studies in Business**

Topics vary. (Previously listed as ADM 781.)

## Library and Communication Science/LCS

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**611-3 Reference Materials and Bibliography**

Important reference works, indexes, and bibliographies with practical problems in their use. Students examine their roles in the interaction between the user and the information environment.

**613-3 Introduction to Archives and Manuscripts**

Acquaints students with the fundamental problems and techniques of managing a historical archive or manuscript collection.

**615-3 Information Retrieval through Technology**

Search strategies are developed and information retrieval technology is used to access sources. Instruction is given on how to implement on-line skills in an educational setting. Graduate students develop extensive resources, devise appropriate search strategies, and discuss and conduct research in greater depth.

**621-4 Cataloging and Classification**

The development of the Dewey Decimal classification scheme and its application to library media center situations. The basic principles of descriptive cataloging; application of current cataloging rules, including subject headings.

**635-3 Production of Instructional Materials**

Nontechnical course with emphasis on production of locally made materials for classroom use including mounting, lettering, script writing, photography, tape recording, and transparency production.

**645-3 Storytelling**

Fundamental principles of the art of storytelling including techniques of adaptation and presentation. Broad foundation in the materials of literature, styles of presentation, story cycles, methods of learning, and practice in storytelling. Planning the story hour for the school and public library, recreational center, and for radio and television.

**646-3 Teaching Library and Research Skills in Elementary and Secondary Schools**

Study of the hierarchy of library and library research skills, ways to develop materials and to teach those skills; introduction to computer-assisted information retrieval.

**649-3 Introduction to Instructional Media**

Survey course in instructional media including the interpretation of visuals (projected and nonprojected), film, instructional TV, gaming, audio technology, multimedia systems, computers, operation of audiovisual equipment, and media facilities. Focuses on the appropriate use of media for specific instructional outcomes.

**651-3 Educational Use of Broadcast Media**

The potential, limitations, and techniques for the use of broadcast media in the educational process.

**655-4 Television Production**

The elementary problems of television production. Introduction to television techniques, and participation on television productions in a wide variety of capacities. Programming use within the educational setting is emphasized.

**656-4 Advanced Television Production**

Improves the skills, knowledge, and creativity used in television broadcasting. Programming and production for educational and informational broadcasts are emphasized. Prerequisite: LCS 455 or 655 or permission of instructor.



**661-3 Selection of Materials**

Selection of materials suitable for the library media center or the elementary/secondary school with emphasis on nonprint materials.

**663-3 Literature for Adolescents and Young Adults**

Survey, evaluation, and selection of books; techniques of reading guidance; and promotion of books.

**670-1 to 6 Workshop in Library and Communication Science**

An intensive study of a selected area of library and communication science designed to meet the needs of librarians, audiovisual personnel, and others interested in the media and communication fields. Titles vary.

**681-4 to 12 Library/Media Practicum in Elementary Schools**

Supervised practice in elementary school media center. Field experience included. Prerequisite: LCS 611, 621, 649, 691.

**682-4 to 12 Library/Media Practicum in Secondary Schools**

Supervised practice in secondary library media center. Field experience included. Prerequisite: LCS 611, 621, 649, 661, 691.

**685-3 Computers for Educators**

Computer software and hardware systems, their uses, and their effect on education and the teacher.

**686-3 Applications of Computers in Education**

Types of educational software and applications, software evaluation, curriculum development, and lesson planning integrating computer courseware.

**687-4 Introduction to BASIC for Educators**

Introduction to computer programming in the BASIC language including programs and techniques useful to educators. Topics include techniques for program design, flowcharting, coding, testing, and documentation.

**688-3 The Writing Process and the Use of Computers**

Provides knowledge of the writing process in drafting, revision, and manuscript preparation through word processing. Related software examined. Keyboard skills required.

**691-3 Organization and Administration of School Media Centers**

Administrative practices and services that relate to the school library media center. Considers problems pertaining to standards, legislation, personnel, planning facilities, materials, instruction, and management procedures.

**700-3 Principles and Application of Communication Theory**

An examination of communication theory relevant to the role of the communication specialist. Special consideration given to the changing pattern of communication roles and the application of communication theory to the problems of the specialist. Also focuses on the possible consequences of the diffusion of communication innovations within the business, educational, and governmental institutions of American society.

**711-3 Development of Collections**

The philosophy and methodology of building collections for libraries and information centers. Basic national and trade bibliographic tools, selection aids, and the mechanics of development. The importance of a well-conceived development policy is emphasized.

**717-3 Information Sources in the Humanities**

Surveys the broad range of information sources in the humanities—philosophy, religion, music, the arts, and literature. Efficient retrieval and use of the sources are emphasized.

**718-3 Information Sources in the Social Sciences**

Surveys the broad range of information sources in the social sciences—history, political science, geography, anthropology, psychology, education, and business and economics.

**719-3 Information Sources in Science and Engineering**

Introduction to the broad range of information sources and methods of access to specific data in science and engineering. Methods of information exchange and dissemination within each of the specific disciplines are examined. Emphasis on acquiring sufficient skills to enable students to provide reference and information services in a variety of libraries and information environments.

**721-3 Selection and Use of Media Equipment and Computer-Based Library Systems**

Students become acquainted with the broad range of media equipment and computer-based library systems used in various types of libraries, media centers, and information environments. The tools and criteria for selection and use of such equipment are also discussed.

**723-4 Principles of Information Organization**

Analyzes the theories and methods of organizing information and collection for efficient and effective use. Emphasis on the principles underlying the organization of knowledge and the application of classification schemes and cataloging techniques to library and learning center situations. The development and use of abstracts and indexes are examined.



**176** Courses/Library and Communication Science

**735-3 Advanced Production of Media Materials**

Examines the philosophy and methodology of producing media materials. Examines basic and advanced techniques of media materials production, including the tools, materials, and mechanics of each process. The importance of a well-conceived production and use policy is emphasized.

**740-3 History of Books and Printing**

Historical survey of the book and printing: ancient writing materials, medieval manuscripts, early printed books, modern printing and book design, recent trends and developments.

**749-3 Developing Materials for Instruction**

Advanced course in the development of a wide range of techniques and materials for the improvement of instruction. Students develop and create specific instructional materials for a particular class or grade level.

**770-1 to 9 Independent Study**

An individualized course of study under the close supervision of a faculty member. May include extensive readings, the performance of a research project, a paper, or a production.

**779-3 Seminar in Educational Media**

Individual and group study of problems related to library/media work in elementary and secondary schools. For educational media majors only.

**780-3 to 12 Internship**

Students are assigned for a maximum of ten hours per week to a library, learning center, computer facility, or broadcasting operation to gain practical experience under supervised conditions. Graded pass/unsatisfactory.

**781-3 LOGO and Problem Solving**

Provides an introduction to LOGO with emphasis on the problem-solving processes of the language for educators. Educators have an opportunity to be involved with the LOGO learning process and to prepare implementation of LOGO in their classrooms. Completion of a computer literacy course or permission of instructor required.

**782-3 Designing Educational Software**

Elements of instructional design, storyboarding instruction, and translation of instruction into computer software. Completion of course in entry-level BASIC programming language and curriculum development or equivalent required.

**795-3 Administration and Supervision of the Audiovisual Program**

Qualifications and duties of the director: planning and administering the program, preparation of budget, buying equipment, handling materials, in-service training, and evaluation of the program. Prerequisite: LCS 449 or 649 or ED 776 or departmental approval.

**799-1 to 9 Master's Project**

The project may be a thesis or creative production and is prepared under the guidance of the student's advisory committee.

## **Linguistics/LI**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**671-4 Introduction to Historical and Comparative Linguistics**

Principles of the historical and comparative study of languages; introduction to Indo-European, Germanic, Romance, and Slavic philology.

## **Management/MGT**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**621-3 Graduate Survey in Management**

Survey course of basic management designed for students who have had no previous course work in management.

**700-3 Organizational Behavior and Theory**

Analysis of the fundamental behavioral concepts and processes of organization. Evaluation of approaches to major behavioral issues such as motivation, communication, leadership, organization climate, group behavior, authority and power, management development, and behavioral research and experimentation. Prerequisite: MGT 621 or equivalent.

**703-3 Seminar in Personnel Administration**

Analysis of the principal functions, processes, and problems involved in the management of human resources. Evaluation of personnel systems, with emphasis on implications of personnel policy and practice. Prerequisite: MGT 621 or equivalent.

**705-3 Seminar in Industrial Relations**

Synthesis of background and development of labor-management relations. Analysis of contemporary employee relations problems emphasizing negotiation, contract development, and administration and conflict resolution. Prerequisite: MGT 621 or equivalent.



**706-3 Organizational Development and Change**

Addresses both organization design and change. Organization development is presented as an ongoing change process that must be planned and managed. A variety of interventions are explained, and situations are analyzed to determine effectiveness.

Prerequisite: MGT 700.

**711-3 Seminar in Research and Development Management**

Seminar of research and development management problems and discussion of possible solutions. Case studies provide the framework for understanding technological change as an essential element of management. Prerequisite: MGT 621 or equivalent.

**714-3 Technology Assessment/Technological Forecasting**

Allows students to consider and apply several techniques of forecasting rates of technological change. The techniques to be considered include trend extrapolation, envelope curve forecasting, methodologies using figures of merit, and the Delphi method. Includes lessons from the past as well as exercises in applying technological forecasting techniques to long-range planning. The integration of the technological forecasting with long-range planning is stressed. Prerequisite: MGT 621 or equivalent.

**731-3 Administrative Policy and Decisions**

Enables students to bring together all aspects of administrative policy making through the use of specific case problems. Focuses on the strategic management process.

**741-3 Operations Management**

Introduction to the management of operating systems; techniques and methods employed to plan and control manufacturing and other operating systems. Designed for individuals who have had no previous course in production or operations management. Prerequisite: MGT 621; MS 621, 622; or equivalent.

**750-3 Materials Management**

Survey of materials management functions in modern organizations including purchasing, shipping and receiving, transportation, traffic, warehousing, inventory control, and materials handling. Emphasis is on procurement and logistics support of organizational operations. Prerequisite: MGT 621 or equivalent.

**751-3 Production and Inventory Management**

Seminar in policies, practices, and techniques for the planning and control of inventories and production levels. Major topics include forecasting, inventory management systems, and material requirements planning (MRP).

Prerequisite: MGT 741; MS 621, 622; or permission of instructor.

**752-3 Quality Assurance**

Seminar in policies, practices, and techniques for the planning and control of the quality function. Major topics include capability analysis, process control techniques, and monitoring of incoming and outgoing quality levels. Prerequisite: MGT 741; MS 621, 715; or permission of instructor.

**753-3 Selected Topics in Management**

Topics as given below.

753A—Topics in Operational Management

753B—Topics in Personnel Administration

753C—Topics in Systems Management

753D—Topics in Industrial Relations

753E—Topics in Organizational Development

**755-3 Health Care Management**

(Listed jointly with CME 731 and EC 755.)

Overview of health care systems, public and private. Topics include managing health service organizations and health delivery systems, marketing health care, and major influences on health professions and organizations. Seminar format. Prerequisite: MGT 621.

**763-3 Systems Management**

Presents management theory in a systems framework to facilitate the study, analysis, and operation of organization. Case studies provide an opportunity to match theory with business and industrial practice. Prerequisite: MGT 621 or equivalent.

**780-6 Management Internship**

One-quarter internship in a selected private or governmental organization under the direction of a faculty adviser and employment supervisor. Details to be arranged by the department or college office. Enrollment in the M.B.A. program, completion of at least seven out of ten core courses, and departmental approval required.

**781-1 to 3 Special Studies in Management**

Intensive reading or research in a selected field of advanced management. Titles vary.

**799-1 to 9 Thesis**



## Management Information Systems/MIS

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 621-3 *Introduction to Management Information Systems*

Overview of the role of information systems in the functional areas of business and in decision support for the organization. Discusses being a user/manager in the systems development life cycle. Assumes personal computer literacy. Prerequisite: CS 205 or equivalent. (Previously listed as AIS 621.)

### 760-3 *Management Information Systems, Analysis, and Design*

Surveys structured analysis and design techniques used in the development of management information systems. Emphasizes developing and documenting information requirements and how the requirements are translated into systems requirements. Assumes familiarity with microcomputers. Prerequisite: MIS 621 or equivalent. (Previously listed as AIS 740.)

## Management Science/MS

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 621-3 *Survey of Mathematics for Business, Economic, and Logistic Research*

Develops competence in quantitative methods for the analysis of business problems by providing students with a background in matrix algebra, and differential and integral calculus. (Previously listed as QBA 620.)

### 622-3 *Graduate Survey in Statistics*

Basic statistical analysis covering descriptive statistics relating to central location, spread and shape, probability distributions, sampling statistics, and point and interval estimation. Computer software packages are used. Prerequisite: MS 621 or equivalent. (Previously listed as QBA 621.)

### 650-3 *Systems Simulation in Business and Economics*

Introduction to simulation techniques as applied to business and economic systems. Topics include basic concepts, applications, design, and operation of computer models. Prerequisite: CS 142, MS 621, 622 or permission of instructor. (Previously listed as QBA 652.)

### 715-3 *Statistical Methods for Business Decisions*

Statistical techniques including regression, correlation, hypothesis testing, and analysis of variance. Prerequisite: MS 621, 622. (Previously listed as QBA 723.)

### 717-3 *Quantitative Methods for Business Decisions*

Surveys various quantitative models used in analyzing business problems. Emphasis on how these models are used to aid in the decision-making process. The computer is used to obtain model solutions. Prerequisite: MS 621, 622. (Previously listed as QBA 724.)

### 725-3 *Business and Social Science Research Methods*

Statistical analysis procedures including bivariate, multiple, and curvilinear regression and correlation; the concepts and applications of two group and multiple discriminant analysis; and an introduction to principal component analysis. This course is application oriented and includes the use of computer packages. Prerequisite: MS 715. (Previously listed as QBA 725.)

### 729-3 *Random Sampling Techniques and Multifactor ANOVA for Modern Business*

Stratified and cluster sampling procedures as used in marketing, economics, and management. Single and multifactor analyses of variance applicable to audits, manufacturing data, and administrative/economic/management decisions. Prerequisite: MS 715. (Previously listed as QBA 729.)

### 730-3 *Operations Research Techniques for Business Decisions*

Survey of operation research techniques for modeling nonlinear and probabilistic business decisions. Topics include nonlinear optimization, simulation, waiting line analysis, and Markov processes. Computer software packages are used. Prerequisite: MS 715, 717. (Previously listed as QBA 726.)

### 760-3 *Logistics Systems Design*

Examination of the major engineering and management techniques involved in the design, fielding, operation, and phase-out of equipment systems. The impact of maintainability, availability, and reliability on system costs is also covered. Prerequisite: MS 717 or permission of instructor. (Previously listed as QBA 764.)

### 765-3 *Inventory Management*

Extension of techniques surveyed in MGT 741 for forecasting and control of inventory systems. Topics include exponential smoothing, trend and seasonal forecasting techniques, safety stock and order quantity models, and aggregate inventory management methods. Prerequisite: MGT 741, MS 621, 622.



**770-3 Selected Topics in the Management Sciences**

Seminar on one of the areas of management science (i.e., operations research, statistical analysis, and logistics). Topics vary. (Previously listed as QBA 753.)

**780-3 to 6 Internship in Management Science**

One-quarter internship in a selected private or governmental organization under the direction of faculty adviser and employment supervisor. Completion of at least seven out of ten core courses required. (Previously listed as QBA 780.)

**781-1 to 3 Special Studies in Management Science**

Intensive reading or research in a selected field of management science. Individualized instruction with varying topics. (Previously listed as QBA 781.)

## Marketing/MKT

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**621-3 Graduate Survey in Marketing**

Survey course in marketing designed for students who have had no previous course work in marketing.

**635-3 Starting New Ventures**

Concepts and techniques of how to start your own business. Development of a business plan to encompass opportunity assessment, market analysis, financing, staffing, production, tax accounting, and legal, insurance, and marketing aspects.

**642-3 Direct Marketing**

Introduction to the theories, concepts, and techniques of modern direct marketing. Coverage includes direct response methods in consumer and industrial marketing and in nonprofit organization marketing. Prerequisite: MKT 621 or equivalent.

**653-3 Special Topics in Marketing**

Topics vary. Quantitative techniques of market segmentation, marketing policy in an age of discontinuity, product planning and development, and price management. Prerequisite: MKT 621.

**675-3 Entrepreneurship**

Problems and perspectives in starting new ventures. Concepts and techniques of searching for market opportunities, screening and evaluating potentials, negotiating, and financing to initiate or purchase a company. Includes development of an individual comprehensive written business plan. Prerequisite: MKT 621, FIN 621.

**704-3 Personal Selling and Sales Management**

Overview of the personal selling function and the attendant sales management task as they relate to the total marketing field. Extension of concept and theory into practical application. Prerequisite: MKT 621 or equivalent.

**705-3 Advertising and Sales Promotion**

Thorough examination of advertising and sales promotion with emphasis on practical application of concepts and theory. Includes project development and role playing. Prerequisite: MKT 621 or equivalent.

**707-3 Marketing Research and Analysis**

Understanding the marketing research function in both a basic and an applied sense with emphasis on the concepts, methods, and techniques currently employed in its use as a tool of management. Prerequisite: MKT 741, MS 715.

**710-3 Consumer and Industrial Buyer Behavior**

Development of knowledge of the behavioral content of marketing in consumer, industrial, and international fields. Examination of applicable theory, research findings, and concepts that are provided by psychology, sociology, anthropology, and marketing. Understanding buyer behavior based on the sources of influence: individual, group, culture, and environment. Prerequisite: MKT 621.

**713-3 Logistics Systems**

Examination of the concept of a logistics system, its components, and their relationship. Emphasis on identification of logistics system components and the impact of logistics systems on the economy and the organization. Consideration of institutions and managerial functions in marketing channels, inventory systems, and transportation modes. Prerequisite: MKT 621 or equivalent.

**716-3 International Marketing**

Introduces the concepts and language of international marketing and examines institutional, behavioral, and managerial aspects of a cross section of national marketing systems and multinational organization operations. Prerequisite: MKT 621 or equivalent.

**720-3 Service and Nonprofit Organization Marketing**

Demonstrates how marketing logic, concepts, and procedures are applied to problems faced by managers in service organizations and hospitals, school systems, universities, charitable organizations, museums, government agencies (police, fire, etc.), and other nonprofit operations. Prerequisite: MKT 621 or equivalent.



**730-3 Consumerism and Social Issues in Marketing**

Critical study of marketing concepts and practices as related to contemporary social issues in the American economy: consumerism, ecology, product safety, truth in advertising, poverty, national interest, social responsibility, and government's role in consumer protection. Emphasis on the institutional and managerial philosophy points of view, not a legal perspective. Prerequisite: MKT 621 or equivalent.

**741-3 Marketing Strategy**

Marketing management in the administration of a business enterprise: product development, pricing, systems of distribution, financing, promotion, and consumer motivation. Cases and readings. A qualifying examination to test entry-level knowledge of basic marketing is given to all students the first week of class. Prerequisite: MKT 621 or equivalent.

**742-3 Industrial Marketing Management**

Seminar in the concepts and techniques of managing the marketing function of industrial organizations. Emphasis is on planning and problem-solving methodology. Readings and marketing strategy plan development. Prerequisite: MKT 621 or equivalent.

**770-4 Marketing Policy and Management**

Study of basic marketing theory including marketing analysis, market planning, organization of performance of marketing activities, and control techniques.

**771-4 Seminar in Marketing**

Seminar dealing primarily with the functional and managerial areas of marketing focusing on the nature and content of the assumptions underlying programs for moving into the market place and on marketing programs, per se.

**780-6 Marketing Internship**

One-quarter internship in a selected private or governmental organization under the direction of a faculty adviser and employment supervisor. Completion of at least seven out of ten core courses and departmental approval required.

**781-1 to 6 Independent Studies in Marketing**

Readings or research in a selected field of marketing.

**799-1 to 9 Thesis****Mathematics/MTH**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**516-4, 517-4 Numerical Methods for Digital Computers**

(Listed jointly with CS 516, 517.) Introduction to numerical methods used in the sciences. Includes methods of interpolation, data smoothing, functional approximation, integration, solutions of systems of equations, and solutions of ordinary differential equations. 3 hours lecture, 2 hours lab. Prerequisite: for 516, MTH 231, 253 or 355, CS 145 or 210, or permission of instructor; for 517, MTH 233, 316.

**532-3 Complex Variables**

Topics discussed include power series expansion, the formula of Cauchy, residues, conformal mappings, and elementary functions in the complex domain. Prerequisite: MTH 232.

**533-3 Partial Differential Equations and Boundary Value Problems**

Partial differential equations, boundary value problems, eigenfunctions, Fourier series, and applications. Prerequisite: MTH 232, 233.

**540-3 History of Mathematics**

Development of calculus from antiquity through Newton and Leibnitz. Development of classical analysis. The rise of abstraction; set theory, algebra, and topology. Modern analysis. Prerequisite: MTH 231, 451, 471.

**545-4 Geometry for Elementary School Teachers**

Axioms, finite geometries, nonmetric and metric lengths, angles, area, volume, polygonal figures, and elementary curves. Prerequisite: MTH 344

**599-1 to 5 Selected Topics**

Selected topics in mathematics.

**606-3 Mathematical Modeling**

Structure and properties of mathematical models. Size effects, dimensional analysis, graphical methods, comparative statics, stability, optimization techniques, probabilistic models, and Monte Carlo simulation. Completion of two courses in calculus required.

**607-3 Optimization Techniques**

(Listed jointly with CS 607.) Concepts of minima and maxima; linear programming; simplex method, sensitivity, and duality; transportation and assignment problems; and dynamic programming. Prerequisite: MTH 233, 253 or 355.



**610-4 Theoretical Foundations of Computing**

(Listed jointly with CS 610.) Examines the limitations of algorithmic processes in problem solving. The following approaches to this issue are presented: Turing machines, Markov algorithms, recursive functions, and the methods of Kleene and Post. Other topics include Church's hypothesis as well as the halting problem and related decision problems. 3 hours lecture, 2 hours lab. Prerequisite: completion of a 300-level mathematics or statistics course and CS 600; or completion of a 400-level mathematics course and CS 145.

**623-3 to 4 Advanced Logic**

(Listed jointly with PHL 623.) Treats logic as an object rather than as a subject. Although it contains extensions to higher order, its main concern is with use of logic and with limitations of logical systems. Titles vary. Prerequisite: PHL 123, 323; or one of these with completion of one mathematics course beyond calculus; or permission of instructor.

**631-3 Real Variables I**

Functions, sequences, limits, continuity, differentiability, integration, and mean-value theorems.

**632-3 Real Variables II**

Infinite series, uniform convergence, Taylor series, improper integrals, special functions, and Fourier series. Prerequisite: MTH 631.

**633-3 Real Variables III**

Theory of functions of several variables and vector-valued functions. Prerequisite: MTH 632.

**634-5 Introduction to Complex Analysis**

Complex arithmetic, differentiation (analytic functions and the Cauchy-Riemann equations), elementary functions and their mapping properties, integration (Cauchy's theorem and Cauchy integral formula), Taylor and Laurent series, poles, residues, and the residue theorem. Prerequisite: MTH 232.

**650-3 Discrete Algebraic Structures**

Introduces several abstract algebraic structures and their models that are used in computer science. Examples include semigroups, finite-state machines, and groups and codes. Prerequisite: MTH 253 or 355 or equivalent.

**651-3, 652-3 Introduction to Modern Algebra I, II**

Introduction to abstract algebraic structures including groups, rings, integral domains, and fields. Prerequisite: for 651, MTH 231; for 652, MTH 651.

**655-5 Matrix Algebra**

(Listed jointly with BMS 655.) Matrices, systems of equations, vector spaces, inner products, linear transformations, determinants, eigenvalues, eigenvectors, quadratic forms, and symmetric matrices. Prerequisite: MTH 231.

**657-3 Combinatorics**

Topics from permutations, combinatorics, generating functions, recurrence relations, and Polya's theory of counting. Prerequisite: MTH 231.

**658-3 Applied Graph Theory**

(Listed jointly with CS 658.) Introduction to methods, results, and algorithms from graph theory. Emphasis on graphs as mathematical models applicable to organizational and industrial situations. Prerequisite: MTH 231, CS 142.

**671-3 Geometry**

Topics in the foundation of Euclidean geometry, introduction to non-Euclidean and other geometries. Prerequisite: MTH 231.

**672-3 Projective Geometry**

Projective and affine planes and spaces. Change of coordinates. Projective transformations. Conics. Prerequisite: MTH 231.

**675-4 Differential Geometry**

Calculus on Euclidean space, Frame fields, calculus on a surface, shape operators, and geometry of surfaces in Euclidean 3 space. Prerequisite: MTH 232.

**680-3 Methods of Applied Mathematics: Geometric Methods**

Basic mathematical tools for the description of physical systems in three-dimensional space: vector and tensor analysis, matrices, and curvilinear coordinate systems. Prerequisite: MTH 232, 253 or 355.

**681-3 Methods of Applied Mathematics: Differential Equations**

Solution methods for ordinary differential equations commonly arising in physics and engineering. Systems of equations, linear spaces, eigenvalue problems, Sturm-Liouville theory, and orthogonal functions. Additional topics may include Bessel and Legendre functions, stability theory, Liapunov's methods, autonomous systems and the Poincare, phase plane, and existence and uniqueness theorems. Prerequisite: MTH 233, 355 or 480.

**682-3 Methods of Applied Mathematics: Integral Methods**

Use of integral transforms in the solution of differential and integral equations. Fourier series, Fourier and Laplace transforms and inverses, integral equations, and Green's functions. Prerequisite: MTH 332 or 434; MTH 355 or 480.



**688-1 to 5 Independent Reading**

Titles vary.

**692-1 to 5 Seminar****699-1 to 5 Selected Topics**

Selected topics in mathematics.

**700-3 Principles of Instruction in Mathematics**

Survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction.

**716-4 Numerical Analysis I: Applied Linear Algebra**

(Listed jointly with CS 716.) Topics chosen with emphasis on computational linear algebra. Systems of linear equations and Gaussian elimination; computation of eigenvalues and eigenvectors; matrix exponential; norm and condition number; and iterative methods. Prerequisite: MTH 355 and CS 142, or knowledge of a high-level language, or permission of instructor.

**717-4 Numerical Analysis II: Finite Difference Methods for Partial Differential Equations**

(Listed jointly with CS 717.) Finite difference methods for partial differential equations; analysis of stability and convergence. Prerequisite: MTH 333, 431, 716 or permission of instructor.

**718-4 Numerical Methods III: Finite Element Methods for Partial Differential Equations**

(Listed jointly with CS 718.) Finite element methods for elliptic boundary value problems, analysis of errors, approximation by finite element spaces, effects of curved boundaries, numerical integration, and finite element methods for parabolic problems. Prerequisite: MTH 333, 431, 716 or permission of instructor.

**725-4 Computational Logic**

Introduces predicate logic as an inference system, emphasizing refutation procedures, problem reduction, and resolution. A basis for studying logic programming and artificial intelligence. Prerequisite: CS 400, or equivalent and departmental approval.

**730-4 Principles of Analysis**

Metric spaces: convergence, completeness, compactness, Ascoli-Arzelà Theorem. Stone-Weierstrass Theorem. Banach spaces. Dual of  $L^p$ , of  $C[a,b]$ . Prerequisite: MTH 633.

**731-4 Real Analysis I**

Lebesgue measure and integration on the real line. Convergence theorems, differentiation of integrals, functions of bounded variation, and absolute continuity. Prerequisite: MTH 730.

**732-4 Real Analysis II**

$L^p$  spaces and their bounded linear functionals. Banach spaces, Hahn-Banach theorem, and closed-graph theorem. Hilbert space, Riesz representation theorem, orthonormal bases, and general measure spaces. Prerequisite: MTH 731 or equivalent.

**733-4 Real Analysis III**

Outer measure, measure, integration, general convergence theorems, Radon-Nikodym theorem, product measure, and Fubini's theorem. Prerequisite: MTH 732 or equivalent.

**751-4 Algebra I**

Group theory-isomorphism theorems, Jordan-Hölder theorem, permutation groups, Sylow theorems, finitely generated Abelian groups, and free groups. Prerequisite: MTH 355, 452; or equivalent.

**752-4 Algebra II**

Ring theory-polynomial rings, unique factorization, radicals, and Wedderburn-Artin structure theory. Prerequisite: MTH 751.

**753-4 Algebra III**

Field theory-simple extensions, Galois theory, solvability by radicals, cyclotomy, finite fields, and Wedderburn's theorem. Prerequisite: MTH 752.

**771-4 Topology**

Topological spaces and elements of point set theory. Prerequisite: MTH 432 or completion of an equivalent undergraduate analysis course.

**777-4 Applied Analysis I**

Function spaces, differential and integral equations, fixed point theorems, Hilbert spaces, compact operators, eigenvalues, eigenfunction expansions, and Sturm-Liouville problems. Prerequisite: MTH 730.

**778-4 Applied Analysis II**

Inverse operators, fixed-point theorems, compactness, variational methods, and functional analysis of numerical methods. Prerequisite: MTH 777.

**792-1 to 5 Special Problems**

Titles vary.

**799-1 to 5 Selected Topics**

Selected topics in mathematics.

**800-1 Graduate Seminar****830-1 to 4 Topics in Analysis****850-1 to 4 Topics in Algebra****870-1 to 4 Topics in Geometry****899-1 to 18 Graduate Research**

Titles vary.



## Mechanical Systems Engineering/MSE

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 513-4 *Strength of Materials*

Axial and shear stresses and strains, biaxial loading, torsion of circular shafts, shear and bending moment diagrams, deflection of beams, and column theory. 3 hours lecture, 2 hours lab. Prerequisite: MSE 212 or permission of instructor. (Previously listed as EGR 513.)

### 515-4 *Thermodynamics I*

Classical thermodynamics with applications of the first and second laws to engineering systems. (Previously listed as EGR 515.)

### 516-4 *Thermodynamics II*

Concepts of availability and irreversibility, power and refrigeration cycles, thermodynamic relations, compressible flow, and mixtures and combustion. 3 hours lecture, 2 hours lab. Prerequisite: MSE 515.

### 517-4 *Fluid Dynamics*

Fluid properties, fluid statics, one-dimensional compressible and incompressible flow, flow of real fluids, and flow measurements. 3 hours lecture, 2 hours lab. Prerequisite: MSE 515. (Previously listed as EGR 517.)

### 518-4 *Heat Transfer*

Principles that govern heat transfer in solids, fluids, vacuum, and at interfaces of solids and fluids are examined. Laboratory experiments to illustrate these phenomena. 3 hours lecture, 2 hours lab. Prerequisite: MSE 517. (Previously listed as EGR 518.)

### 560-4 *Mechanical Vibrations*

Modeling and analysis of single and multi-degree freedom systems under free and forced vibration and impact. Lagrangian and matrix formulations, energy methods, and introduction to random vibrations. Prerequisite: ESE 522. (Previously listed as EGR 560.)

### 570-4 *Materials Engineering Science*

Effect of atomic, molecular, and crystalline structures on the properties of materials with emphasis on electronic materials and ceramics, characterization of materials, and device fabrication. (Previously listed as EGR 570.)

### 571-3 *Structure and Properties of Engineering Materials*

Effect of microstructure, phase equilibrium, and processing on properties of structural materials including metallic alloys, polymers, and composites. Prerequisite: MSE 513, 570.

### 575-3 *Physical Metallurgy I: Metallurgical Thermodynamics*

Application of classical thermodynamics to metals and alloys. Free energy concepts, thermodynamic fundamentals of phase equilibria, and single phase and multi-phase alloy systems. Prerequisite: MSE 570. Pre- or corequisite: MSE 515. (Previously listed as EGR 575.)

### 576-3 *Physical Metallurgy II: Transformations in Metals*

Fundamentals of phase transformations in metals and alloys. Applications to recovery and recrystallization, solidification, heat treatment of steel, and precipitation hardening. Prerequisite: MSE 575. (Previously listed as EGR 576.)

### 585-2 *Metallography Laboratory*

Preparation of metallographic specimens; use of the metallurgical microscope including the preparation of photomicrographs. Prerequisite: MSE 570. (Previously listed as EGR 585.)

### 586-2 *Materials Testing Laboratory*

Fundamentals of mechanical testing instrumentation and techniques, including the tensile test, hardness tests, effect of heat-treatment on strength, and correlation of microstructure, composition, and properties. Prerequisite: MSE 575, 585. (Previously listed as EGR 586.)

### 603-4.5 *Measurement Systems*

Study of general concepts of measurement instrumentation of physical quantities and of specific measuring devices for motion, force, torque, pressure, sound, flow, and temperature measurement. 3 hours lecture, 3 hours lab. Prerequisite: ESE 522. (Previously listed as EGR 603.)

### 608-3 *Design Optimization*

Concepts of minima and maxima; linear, dynamic, integer, and nonlinear programming. Variational methods. Engineering applications are emphasized.

### 611-4 *Advanced Dynamics*

Kinematics of a particle in three dimensions for various coordinate systems, fixed and moving. Dynamics of a particle and system of particles including work-energy and impulse-momentum. Kinematics of general rigid body motion, principal axes of inertia, Eulerian angles, dynamics of general rigid body motion, and Lagrange's equations. Prerequisite: MSE 213. (Previously listed as EGR 611.)

### 612-4 *Introduction to Finite Element Analysis*

Finite element formulations for line, surface, bending, torsion, and three-dimensional elements. Numerical methods and applications of FEM programs in structural design and solid mechanics. Prerequisite: MSE 313 (513), CS 210, MTH 233. (Previously listed as EGR 612.)



**614-4 Mechanical Design I**

Fundamental concepts in design for static strength, fatigue, and impact loading; application to selected mechanical components and systems. Prerequisite: MSE 513, 571. (Previously listed as EGR 614.)

**615-4 Mechanical Design II**

Design of mechanical elements such as springs, bearings, shafts, gears, clutches, brakes, and flywheels; students conduct an individual design project. Prerequisite: MSE 614.

**617-3 Mechanics of Viscous Fluids**

Fundamental equations of viscous flow for laminar and turbulent flows. Boundary layer analysis. Analytical and numerical solutions of the equation of motion. Prerequisite: MSE 517. (Previously listed as EGR 617.)

**618-3 Heat Conduction in Solids**

Analytical and numerical techniques for heat conduction problems in one, two, and three dimensions for steady and transient cases. Phase-change problems. Prerequisite: MSE 518. (Previously listed as EGR 618.)

**623-4 Energy Conversion**

Study of important new developments in the field of energy conversion. Thermoelectric, photoelectric, thermionic, electromechanical, and electrochemical systems are studied. Prerequisite: MSE 515. (Previously listed as EGR 623.)

**632-3 Introduction to Flight Control Systems**

Development of the equations for general aircraft motion. Perturbed state equations. Basic aerodynamic characteristics, control surface effectiveness, and stability and control derivatives. Dynamic stability and control of the airplane. Automatic flight control. Prerequisite: ESE 625. (Previously listed as EGR 632.)

**656-4 Introduction to Robotics**

(Listed jointly with CEG 656 and ESE 656.) Introduction to the mathematics, programming, and control of robots. Topics include coordinate systems and transformations, kinematic equations, trajectory planning, dynamics, control, programming, and computer vision. Prerequisite: MTH 233. (Previously listed as EGR 656.)

**670-3 Failure Analysis**

Engineering aspects of failure analysis, failure mechanisms, and related environmental factors. Analysis of actual service failure. Prerequisite: MSE 513, 571.

**677-4 Mechanical Behavior of Materials**

Crystal plasticity and single crystal behavior. Introduction to dislocation theory. Strengthening mechanisms and polycrystalline behavior. Introduction to viscoelasticity. Fracture, fatigue, and creep of materials. Prerequisite: MSE 513, 570. (Previously listed as EGR 677.)

**678-3 X-Ray Spectral Analysis**

Electron microprobe and X-ray fluorescence for analysis of alloys and other materials are explained and demonstrated with examples. 2 hours lecture, 1 hour lab. Prerequisite: MSE 682 or permission of instructor. (Previously listed as EGR 678.)

**679-4 Materials Corrosion**

(Listed jointly with CHM 679.) Survey of the principles of corrosion processes with application to metallic and nonmetallic materials. Principles of electrochemistry are included. Prerequisite: MSE 315 (515) and 370 (570); or corequisite CHM 453 (553); or permission of instructor. (Previously listed as EGR 679.)

**681-3 Nondestructive Testing**

Survey of the principal techniques used to detect and evaluate flaws in material components such as castings, weldments, and composites. Includes liquid penetrant, ultrasonic, radiographic, eddy current, and magnetic test methods. Prerequisite: MSE 570. (Previously listed as EGR 681.)

**682-4 X-Ray Methods in Materials Science**

Introduction to the theory and practice of diffraction methods in the study of alloys, refractory materials, and polymers. 2 hours lecture, 4 hours lab. Prerequisite: MSE 376 (576) or permission of instructor. (Previously listed as EGR 682.)

**683-3 Ceramics and Refractories**

Introduction to ceramic materials, including descriptions of ceramic raw materials, glasses, solid state chemistry, microstructures, elasticity and strength, and thermal stresses. Prerequisite: MSE 575. (Previously listed as EGR 683.)

**684-4 Physical Ceramics**

Processing, microstructure, and properties of ceramics; defect equilibria in oxides; thermal, optical, electrical, and mechanical properties of ceramic materials. Ceramics for special applications. 3 hours lecture, 2 hours lab. Prerequisite: MSE 683.

**685-4 Solidification Processing**

Fundamentals of melt solidification, application to metals casting technology, and an introduction to powder metallurgy. 3 hours lecture, 2 hours lab. Prerequisite: MSE 575. (Previously listed as EGR 685.)

**686-4 Deformation Processing**

Fundamentals of principal deformation processing systems including forging, extrusion, rolling, and sheet forming; material response and formability; and mechanics and analysis of selected processes. 3 hours lecture, 2 hours lab. Prerequisite: MSE 513, 570. (Previously listed as EGR 686.)



**687-5 Machining**

Fundamentals of machining with emphasis on engineering models of machinability, chip formation, cutting forces and power, and lubrication. Introduction to numerical control machining. 3 hours lecture, 2 hours lab. Prerequisite: MSE 570. (Previously listed as EGR 687.)

**688-4 Powder Processing**

Production, characterization, and processing of powder metals and ceramics. Mechanisms of sintering and hot compaction. Hot forming of powder compacts. Prerequisite: MSE 575. (Previously listed as EGR 688.)

**689-4 Engineering Plastics: Materials, Processes, and Design**

(Listed jointly with CHM 669.) Properties and manufacturing processes of engineering plastics and the effect of these factors on plastics design. Illustrative laboratory projects are included. 2 hours lecture, 4 hours lab. Prerequisite: CHM 665. (Previously listed as EGR 689.)

**699-1 to 5 Special Problems in Engineering**

(Listed jointly with BME 699, ESE 699, and EGR 699.) Special problems in advanced engineering topics. Titles vary.

**700-3 Principles of Instruction in Engineering**

(Listed jointly with BME 700 and ESE 700.) Survey of available instructional materials and discussion of educational theories and techniques leading to more effective instruction. For first-year graduate teaching assistants only. (Previously listed as EGR 700.)

**710-4 Computational Methods in Structural Dynamics**

Vibration of discrete and continuous systems. Computational methods for the eigenvalue problem. Large-dimensional systems. Approximate methods for continuous systems. Substructure synthesis. Response of vibrating systems. 3 hours lecture, 2 hours lab. Prerequisite: MSE 560, FORTRAN programming.

**712-4 Finite Element Method Applications**

Concepts of dynamic analysis using the finite element method (FEM). Application of various computational techniques to dynamic structures and thermal systems including vehicle dynamics. 3 hours lecture, 2 hours lab. Prerequisite: MSE 612. (Previously listed as EGR 712.)

**720-4 Advanced Mechanics of Solids**

Introduces theory of elasticity. Topics in advanced strength of materials. Energy methods. Computational techniques in solid mechanics. Introduces plates and shells. Prerequisites: MSE 614.

**730-4 Advanced Fluid Dynamics**

Theory and application of conservation equations for fluid mechanics. Develops boundary layer equations for laminar and turbulent flows. Topics include incompressible, viscous, supersonic, and hypersonic flows. Prerequisite: MSE 517.

**734-4 Computational Fluid Dynamics**

Introduction to modern computational fluid dynamic (CFD) methods. Survey of current numerical procedures to solve fluid dynamic problems from incompressible to hypersonic flows. 3 hours lecture, 2 hours lab. Prerequisite: MSE 730, FORTRAN programming. (Previously listed as EGR 734.)

**736-3 Convective Heat and Mass Transfer**

Heat and mass transfer analysis within conductors and over submerged objects for laminar and turbulent flows. Film condensation and boiling. Prerequisite: MSE 518. (Previously listed as EGR 736.)

**738-3 Radiation Heat Transfer**

Fundamentals and application of radiation heat transfer, radiation between gray and nongray bodies, network techniques, radiation through absorbing media, and radiation between gases and surrounding surfaces. Finite difference solution for radiation problem. Prerequisite: MSE 518. (Previously listed as EGR 738.)

**742-3 Numerical Simulation of Heat and Mass Transfer**

Computational techniques for the solution of engineering problems in multidimensional fluid flow, and heat and mass transfer including two-phase flows and chemical reactions. Prerequisite: MSE 730.

**756-4 Robotics**

(Listed jointly with CEG 756 and ESE 756.) Detailed study of the dynamics and control of robotic systems. Includes trajectory planning, rigid-body dynamics, rotating coordinate systems, and computer implementation of various adaptive and optimal control schemes. Prerequisite: MSE 656, CEG 611, ESE 627 or 720. (Previously listed as EGR 756.)

**757-4 Robotics II**

(Listed jointly with CEG 757 and ESE 757.) Studies in programming and vision techniques applicable to the control of robotic systems. Includes robot languages, teach mode, image processing, scene analysis, and pattern recognition. Prerequisite: MSE 756. (Previously listed as EGR 757.)



**780-3 Applied Plasticity**

Yield criteria and flow rules for isotropic and anisotropic materials. Mechanics of plastic deformation including slab, upper-bound, slip-line field, and finite-element methods. Applications to metal forming. Prerequisite: MSE 720. (Previously listed as EGR 780.)

**782-3 Processing of Engineering Materials**

In-depth study of processing-microstructure-property relationships for selected engineering materials. (Previously listed as EGR 782.)

**880-3 Selected Topics in Systems Engineering**

(Listed jointly with BME 880 and ESE 880.) Selected topics in current research and recent developments in systems theory and engineering. (Previously listed as EGR 880.)

**890-1 to 5 Special Problems**

(Listed jointly with BME 890, ESE 890, and EGR 890.) Special problems in advanced engineering topics. Titles vary.

**899-1 to 5 Thesis**

(Listed jointly with BME 899, ESE 899, and EGR 899.)

**Microbiology and Immunology/M&I**

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**654-3 Microbial Genetics**

(Listed jointly with BIO 654 and BMS 791.) Basic concepts of production of microbial mutations, their detection, and analysis; the use of microbial genetics in elucidating cellular functions; and the construction of plasmids and their use in genetic engineering. Prerequisite: BCH 421 or BIO 402 or equivalent.

**699-1 to 4 Special Problems in Microbiology**

**700-4 Microbial Inhibitors and Antibiotics**

Mechanism of action of antibiotics and inhibitors in microorganisms at the cellular, macromolecular, and metabolic levels of organization. Emphasis is on research applications and the basis of chemotherapy. Prerequisite: M&I 426 (726), BCH 421 (621) or departmental approval, BIO 402.

**721-4.5 Microbial Physiology**

(Listed jointly with BIO 828.) Study of the physiological and biochemical processes unique to microorganisms.

**726-5 Immunology and Basic Virology**

(Listed jointly with BMS 802.) Fundamentals of immunobiology and basic virology. Emphasis on the regulatory and cellular level of host immune responses against microbial pathogens, as well as mechanisms of immunopathology, and on the characteristics and molecular biology of virus pathogens. Prerequisite: BIO 202, 402; CHM 216 or equivalent.

**727-5 Pathogenic Microbiology**

Microorganisms pathogenic for humans and animals using the organ system approach. Emphasis on mechanisms of pathogenesis and host resistance. Includes a project segment devoted to the independent study of the mechanisms of pathogenesis in the host-parasite interactions of the infectious agents used. Prerequisite: M&I 726; BIO 202 or 402; CHM 216; or departmental approval.

**728-3 Diagnostic Medical Microbiology and Immunology**

Identification of etiological agents of disease with emphasis on identification of bacteria, fungi, and viruses using culture and immunological methods. Prerequisite: BIO 202, 402; CHM 216 or equivalent.

**731-3 Basic Virology**

(Listed jointly with BMS 807.) Introduction to the field of virology with emphasis on animal viruses. Intrinsic properties of viruses and their interaction with cells; multiplication, disease production, genetics, and tumor induction. Projects assigned to each student. Prerequisite: BCH 421, BIO 402, or permission of instructor.

**745-5 Immunobiology**

(Listed jointly with BMS 812.) Biology of the immune system in terms of current concepts of antibody formation and function. Acquired, delayed, and immediate hypersensitivity are studied with respect to immunological deficiencies, malignancy, tolerance, graft rejection, infection, and acquired resistance. Prerequisite: M&I 726, 728; BCH 621, 622, or BIO 402.

**800-1 Microbiology Seminar**

Graded pass/unsatisfactory.

**801-1 to 5 Microbiology and Immunology Seminar/Journal Club**

Selected topics in microbiology.

**822-4 Principles of Host-Parasite Interaction**

(Listed jointly with BMS 801.) Infection and resistance that may result in the production of infectious disease. The effect of microbial virulence factors, mode of entry of microorganisms into the body, their spread through tissue, and the role of the host-immune responses are studied. Prerequisite: M&I 726 or equivalent; BIO 402.

**831-3 Seminar Topics in Molecular Virology**

(Listed jointly with BMS 808.) Structure, infectious process, replication, maturation, release, and genetics at the molecular level of the major groups of animal viruses. Prerequisite: M&I 431 (731).



**833-3 Seminar Topics in Viral Oncology**

(Listed jointly with BMS 809.) Understanding the processes involved in cell transformation by oncogenic viruses. Prerequisite: M&I 431 (731).

**840-2 to 5 Special Topics in Immunology**

(Listed jointly with BMS 813.) Students select, present, and analyze information from current literature in immunobiology. Seminar/discussion format. Prerequisite: M&I 745 or departmental approval.

**842-3 Seminar Topics in Transplantation Immunology**

Survey of the fundamentals of transplant immunology. Topics include mechanisms of intra- and interspecies rejection, histocompatibility genes and their products, graft-versus-host diseases, immunologically privileged sites, techniques for immunosuppression, immune tolerance, and the immunobiology of the maternal/fetal relationship. Prerequisite: M&I 745 or departmental approval.

**843-3 Seminar Topics in Tumor Immunology**

The host-tumor relationship is studied intensively. Interrelationships between tumor growth and host immune responses are examined at the molecular and cellular levels. Prerequisite: M&I 745 or departmental approval.

**844-3 Seminar Topics in Immune Regulation**

Maintenance of immune homeostasis with emphasis on the contributions of lymphocyte subpopulations. Sequelae of immune imbalance are studied. Prerequisite: M&I 745 or departmental approval.

**846-3 Seminar Topics in Infection and Immunity**

(Listed jointly with BMS 818.) Focuses on both beneficial and adverse host responses to microbial and metazoan parasites. Effects of infection on immune function are stressed. Prerequisite: M&I 726, 745, or departmental approval.

**899-2 to 18 Graduate Research**

Supervised thesis research.

**Modern Language Humanities/ML**

See also French, German, Linguistics, and Spanish.

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**599-1 to 4 Studies in Selected Subjects**

Problems, approaches, and topics in the field of modern languages. Titles vary.

**Music/MUS**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**Music Education**

Registration requires graduate standing in music, or permission of the director of graduate studies in music, and permission of the instructor.

**635-4 Introduction to Music Education for the Special Learner**

Materials, techniques, and curriculum for teaching music to the special learner in public and private school music programs.

**680-1 to 4 Workshops in Music**

Selected topics or problems in music, or special areas of music teaching. Titles vary.

**681-1 to 6 Independent Study****701-4 Introduction to Graduate Study in Music Education**

Methods of investigation in music; use of music bibliography; problems of collecting and evaluating information; and reporting of findings.

**702-4 Introduction to Research in Music Education**

Class studies and individual projects. Reading, research, discussion, and reports; interpretation of contemporary research. Prerequisite: MUS 701.

**704-4 Foundations and Principles of Music Education**

Historical, philosophical, and psychological foundations of music education. Principles applied to theoretical and practical problems of music education.

**706-3 Supervision and Administration of School Music**

Function of the supervisor of music in the public school. Curricula, testing programs, in-service training, teaching aids, school-community relationships, and budget.

**707-3 Contemporary Trends in Music Education**

Problems, objectives, and current practices in music education. Contemporary theories of learning applied to music education. The arts in public education.

**711-3 Advanced Conducting—Choral**

Technique and practice of choral conducting and score preparation. Choral music literature suitable for high school and college groups.

**712-3 Advanced Conducting—Instrumental**

Technique and practice of instrumental conducting and score preparation. Instrumental literature suitable for high school and college groups.

**713-3 Choral Literature and Techniques**

Critical study of large group and ensemble literature from 1500 to present. Rehearsal techniques and performance practices. Selection of literature and programming.



**714-3 Instrumental Literature and Techniques**

Critical study of large group and ensemble literature. Rehearsal techniques and performance practices. Selection of literature and programming.

**716-3 Trends in Elementary Music**

Contemporary practices in elementary school music. Creative approaches and techniques; use of new materials.

**717-3 General Music in the Middle School and Junior High School**

Philosophies, objectives, techniques, and materials. The listening program, the changing voice, and creative activities in music for the adolescent and pre-adolescent years.

**718-3 Teaching Music and the Humanities**

Exploration of relationships between music and other arts. Consideration of works of art in terms of social, political, religious, economic, and philosophical implications; teaching the arts as a humanistic discipline.

**721-3 Twentieth-Century Music in the General Music Program**

Critical study of music of the twentieth century, with techniques of teaching this music for grades K-12.

**722-3 Marching Band Techniques**

Advanced study of various marching band styles and techniques. Adopting drum corps techniques, selection of materials, writing shows, and field planning and production.

**780-1 to 4 Pedagogy**

Advanced course in techniques, practices, and materials for group and individual instruction. Musical styles and interpretation. Performance in instruments or voice. Titles vary.

**799-1 to 6 Thesis****Theory of Music**

Registration requires graduate standing in music, or permission of the director of graduate studies in music, and permission of the instructor.

**731-3 Theory of Music**

Written and analytical skills relating to music of period of common practice through the twentieth century with emphasis on four-part homophonic writing.

**732-1 Ear Training**

Sight singing and aural recognition of melodic, harmonic, and rhythmic components in music from the common practice to the present.

**733-3 Analytical Techniques I**

In-depth historical study of musical structures related to the styles of significant compositions from chant through the Baroque period.

**734-3 Analytical Techniques II**

In-depth historical study of musical structures related to the styles of representative compositions from the Classical period to the present.

**735-4 Contrapuntal Techniques**

Study of contrapuntal techniques with practical application in writing and analysis.

**741-3 Band and Orchestral Arranging**

Band and orchestral instrumentation; scoring of transcriptions and original compositions.

**742-3 Choral Arranging**

Arranging for choral ensembles common to schools, grades 6-12.

**Music History and Literature**

The following courses, MUS 746-749, provide advanced studies in music history and literature of the eras named. Course work includes critical analysis of representative works from major composers, with emphasis on stylistically correct performance. The block of courses provides detailed study of the history of musical styles. Registration requires graduate standing in music, or permission of the director of graduate studies, and permission of the instructor.

**746-3 Medieval and Renaissance Music**

(ca. 600-ca. 1600)

**747-3 Baroque Music**

(ca. 1600-ca. 1750)

**748-3 Classic and Romantic Music**

(ca. 1750-ca. 1900)

**749-3 Twentieth-Century Music**

(ca. 1900-present)

**751-3 The Literature of Chamber Music**

Critical study of music literature for small instrumental ensemble.

**Performance**

Registration for graduate credit in any area of performance requires a successful audition.

**Ensembles**

Registration for ensembles also requires permission of the instructor.

**650-3 Opera Production and Coaching**

Production of opera; public performance and individual coaching. For advanced singers. At the discretion of the instructor course requirements may include participation in Dayton Opera productions.

**705-1 Chamber Music****715-1 Ensemble****Private Study****700-1 or 4 Piano****710-1 or 4 Voice****720-1 or 4 Organ****730-1 or 4 Woodwinds****740-1 or 4 Brass****750-1 or 4 Percussion****760-1 or 4 Strings**



## Nursing/NUR

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 614-3 *Selected Topics*

Special topics. For nursing majors only.

### 617-2 to 4 *Selected Topics*

Special topics.

### 701-3 *Professional Nursing Seminar*

Critical review of current issues in nursing practice, education, and administration. Discussion encompasses historical, philosophical, social, economic, political, educational, scientific, technological, legal, and ethical influences on nursing and health care.

### 707-3 *Research Design and Methodology*

Critical analysis of components and methodology of nursing research. Application of the research process in developing a research proposal. Prerequisite or corequisite: Completion of a statistics course.

### 708-3 *Theoretical Basis of Nursing Practice*

Analysis of nursing and other selected concepts, models, and theories as related to nursing practice, administration, and education in development and application of nursing science.

### 710-3 *Advanced Health Assessment*

Use of assessment skills with clients for maximum and altered health states using both theoretical and experiential knowledge as appropriate in the role of the advanced clinical practitioner.

### 711-3 *Advanced Nursing Roles*

Analysis of theoretical base for developing advanced roles. Focuses on role, leadership, organization, and change concepts and theories.

### 712-4 *Community Nursing Practice: Maximum Health States*

Application of community health concepts to designated populations with maximum health potential. Clinical strategies incorporate selected theories such as group dynamics, systems, learning, and change. Clinical practicum required. Prerequisite: NUR 708 and completion of a physical assessment course. (Previously listed as NUR 702.)

### 713-4 *Community Nursing Practice: Altered Health States*

Application of community health concepts to designated populations in altered health states with emphasis on health promotion, rehabilitation, and maintenance. Comprehensive multidisciplinary approaches to client care are explored. Clinical practicum required. Prerequisite: NUR 708 and completion of a physical assessment course. (Previously listed as NUR 703.)

### 714-3 *Selected Topics*

Advanced study of various topics. Titles vary.

### 715-1 to 3 *Independent Study*

Faculty-directed, individualized study in topics selected by the students.

### 720-3 *Foundations of Advanced Clinical Practice*

Analysis of theories and concepts related to advanced nursing practice and alternative models of care. Students concentrate on chosen client population for development of advanced nursing practice role. Prerequisite: NUR 711, completion of six hours clinical support courses.

### 723-7 *Advanced Clinical Practicum*

Application of nursing process in an advanced clinical practitioner role using theoretical and experiential knowledge. Seminar synthesizes previous learning with application to the role of practitioner. Prerequisite: NUR 701, 707, 708, 711, 712, 713, 720, and completion of six hours clinical support courses.

### 732-3 *Health Care Resource Management*

Analysis of human and financial resources management in health care organizations. Specific application is made to nurses who are in administrative roles.

### 733-7 *Practicum in Nursing Administration*

Observation, participation, and practice in the administration of nursing services in health care settings. Seminars synthesize previous learning and application to nursing administration. Clinical practicum required. Prerequisite: NUR 701, 707, 708, 711, 712, 713, EC 630, LAW 680.

### 740-4 *Curriculum Process in Nursing Education*

Analysis of learning theories and models of curriculum design. Development and evaluation of curricula for nursing programs. Prerequisite: NUR 708. (Previously listed as NUR 705.)

### 741-3 *Teaching Strategies in Nursing*

Examination and application of the art, principles, and strategies of teaching in nursing programs. Role of teacher in classroom is explored. (Previously listed as NUR 709.)

### 743-7 *Practicum in Teaching Nursing*

Observation, participation, and practice in teaching nursing concepts. Seminars synthesize previous learning with application to the role of the nurse educator. Clinical practicum required. Prerequisite: NUR 701, 707, 708, 711, 712, 713, 740, 741, and educational support course. (Previously listed as NUR 706.)

### 781-3 *Thesis/Scholarly Project Seminar*

Development of a proposal for a thesis or scholarly project. Seminar focuses on peer review of proposal. Prerequisite: NUR 707.

### 799-1 to 6 *Thesis/Scholarly Project Advisement*

Thesis or scholarly project.



## Office Administration/OA

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 601-1 to 4 *Office Practicum*

Selected and supervised work experience in an office. Prerequisite: Bachelor's degree in business education or completion of 9 credit hours of graduate business education required. Graded pass/unsatisfactory.

## Pharmacology/PHA

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements or special course information.

### 750-3 *Biotransformation and Kinetics*

(Listed jointly with BMS 890.) The general bases of toxicology and therapeutics: pharmacokinetics, xenobiotic metabolism, and their effects on determination of the dose-response-time relationship. Completion of courses in physiology, biochemistry, or calculus, or permission of instructor required.

### 751-4 *General Toxicology I*

(Listed jointly with BMS 887.) Introduction to general toxicology covering the principles of intoxication and detoxication, classification of poisons, exposure characteristics, biotransformation and biokinetics of poisons, systemic toxicology including CNS, splanchnic organs, cardiovascular, hematopoietic, reproductive, respiratory, and skeletal systems.

### 752-4 *General Toxicology II*

(Listed jointly with BMS 888.) Continuation of PHA 751. Introduction to general toxicology. Particular toxic agents are studied, including teratogens, mutagens, oncogens, heavy metals, and other environmental contaminants and toxins. Clinical, forensic, industrial, and agricultural toxicology are addressed along with regulations that apply to the field. Prerequisite: PHA 751.

### 879-5 *General Pharmacology I*

(Listed jointly with BMS 879.) Introduces drug-receptor interactions, dose-response relationships, physico-chemical principles of drug action and distribution, pharmacokinetics, and mechanisms of action plus uses of drugs affecting both autonomic and central nervous system functions. Completion of courses in physiology, biochemistry, and anatomy required.

### 880-4 *General Pharmacology II*

(Listed jointly with BMS 880.) Extends the principles and theories learned in PHA 879 and applies them to the action of drugs on the respiratory, endocrine, GI, and GU systems. Emphasis on antibiotics, antineoplasia, immunosuppressants, and toxicology. Prerequisite: PHA 879.

## Philosophy/PHL

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 532-4 *Studies in Political Philosophy*

Ancient and modern political philosophy. Topics vary.

### 541-4 *Aesthetics*

Study of theories concerning the nature of the work of art, aesthetic experience, the arts, and beauty.

### 549-4 *Asian Religious Philosophy*

(Listed jointly with REL 549.) Perennial themes in Asian cultures, such as individual, society, and cosmos; appearance and reality; time and history; and karma, freedom, and responsibility. Treatment of these themes in the philosophical traditions of Asian cultures.

### 578-4 *Ethics and Medicine*

(Listed jointly with REL 578.) Ethical issues confronting society in the area of medicine and health care, considered from the perspective of philosophical and theological ethics. Examples include ethics of abortion, euthanasia, experimental medicine, and behavior control.

### 581-4 *Philosophy of Religion: Contemporary Western Survey*

(Listed jointly with REL 581.) Cross-disciplinary perspective on philosophical and religious schools of thought in the early twentieth century. Absolute and personal idealism, spirit, value, positivism and naturalism, history and culture, modernism and pragmatism, and religious consciousness and phenomenology.

### 582-4 *Philosophy of Religion: Process*

(Listed jointly with REL 582.) Realism and the revolt against idealism. Cross-disciplinary analysis of major contemporary process philosophers, and the implications of their thoughts for religion. Focus on Alfred North Whitehead.

### 583-4 *Philosophy of Religion: Secular*

(Listed jointly with REL 583.) Cross-disciplinary analysis of modes of human awareness through which religious meaning is expressed. Examination of presuppositions of contemporary secular religious movements in existentialism. The problem of the ultimate from the secular perspective.



**599-1 to 4 *Studies in Selected Subjects***

Problems, approaches, and topics in the field of philosophy.

**601-4 *Major Philosophers***

Introduction to the major writings of the outstanding philosophers. Involves presentation and critical examination of the philosophers' views.

**623-3 to 4 *Advanced Logic***

(Listed jointly with MTH 623.) Treats logic as an object rather than as a subject. Although it contains extensions to higher order, its main concern is with use of logic and with limitations of logical systems. Titles vary. Prerequisite: PHL 123, 323; or one of these together with completion of one mathematics course beyond calculus; or permission of instructor.

**624-4 *Mathematical Philosophy***

Investigation of philosophical theories concerning the nature of mathematics, the ground of mathematical knowledge, the necessity of mathematical truth, the empirical relevance of mathematics, and the relationships between mathematical philosophy and general philosophy. Prerequisite: PHL 123 or permission of instructor.

**631-4 *Classical and Medieval Political Philosophy***

(Listed jointly with PLS 601.) Critical examination of political ideas from 500 B.C. to A.D. 1500 with emphasis on Plato, Aristotle, Cicero, St. Augustine, St. Thomas Aquinas, Luther, Calvin, and Machiavelli.

**632-4 *Modern Political Philosophy***

(Listed jointly with PLS 602.) Critical examination of political ideas from 1600 to 1900 with emphasis on Hobbes, Locke, Rousseau, Montesquieu, Hume, Burke, Hegel, Bentham, Marx, and Mill.

**642-4 *Philosophy and Literature***

Examination of philosophical ideas found in literature, philosophical interpretations of literature, and evaluations of theories and aesthetics of literature.

**667-4 *Philosophy of Mind***

Classical and contemporary approaches to such issues as the nature of mind, relationships of mind to body, knowledge of other minds, intentionality, perception, and agency. Prerequisite: PHL 111 or 112 or permission of instructor.

**681-3 to 4, 682-3 to 4, 683-3 to 4 *Independent Reading***

Faculty-directed readings in philosophical literature.

**694-4 *Existentialism***

(Listed jointly with REL 694.) Representative writers of the existentialist movement.

**695-4 *Metaphysics***

Investigation of classical and contemporary attempts to develop a theory of the nature of being and reality. Prerequisite: PHL 111 or 112 or permission of instructor.

**696-4 *Epistemology***

Origin, certainty, and extent of human knowledge. Prerequisite: PHL 111 or 112 or permission of instructor.

**751-1 to 5, 752-1 to 5, 753-1 to 5 *Research in Philosophy***

Research designed for specific needs of qualified students.

**Physics/PHY**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**500-3 *Properties of Semiconductor Materials***

Crystal structure and growth; quantum theory and atomic structure; energy bands in solids; charge carriers and thermodynamic equilibrium; generation and recombination of excess charge carriers; diffusion; and junctions. Prerequisite: PHY 242.

**501-3 *Semiconductor Device Physics***

Bipolar junction transistors; p-n junction diodes; field effect transistors; integrated circuits; other semiconductor devices; and fabrication of semiconductor devices. Prerequisite: PHY 500 or permission of instructor.

**522-4 *Applied Optics***

Study of optical instruments by means of both geometric and physical optics. The theory and applications of interferometry and light detection devices. Brief introduction to lasers and holography. 4 hours lab for five weeks, 3 hours lecture. Prerequisite: PHY 242.

**532-3 *Lasers***

Introduction to the physics of lasers including emission and absorption processes in lasing, the factors controlling laser gain, the properties of optical resonators, and a survey of salient features for principal types of lasers. Prerequisite: PHY 243 and 260 or CHM 121; or permission of instructor.

**571-3, 572-3 *Analytical Mechanics***

Intermediate problems in statics, kinematics, and dynamics; the study of equilibrium of forces, rectilinear motion, curvilinear motion, central forces, constrained motion, energy and moments of inertia; and the Lagrange method. Prerequisite: PHY 210, 211, or 242; MTH 232. Corequisite: MTH 233.



**610-2 Laboratory Arts and Techniques**

Introduction to hand and machine tools in the fabrication of laboratory equipment. Emphasis is on a "hands-on" approach. Practical experiences are given in vacuum and soldering technology involving commonly used materials. Instructional lecture is included with the lab.

**620-3 Thermodynamics I\***

First and second laws of thermodynamics: general thermodynamic formulas with applications to matter. Prerequisite: PHY 210 and 211 or PHY 242.

**621-3 Statistical Thermodynamics II\***

Kinetic theory of gases. Maxwell-Boltzmann statistics, introduction to quantum statistics. Prerequisite: PHY 620.

**630-2 to 4 Electronics**

The basic theory and application of tubes and transistors in present day circuitry as found in research instrumentation. 1 to 2 hours lecture, 2 to 4 hours lab. Prerequisite: PHY 240, 241, 242, or equivalent.

**642-4 Physical Optics**

The interaction of light and matter and the interpretation of these phenomena using the electromagnetic wave theory of radiation. Topics include emission, coherence, and holography, interference, diffraction, absorption, scattering, and polarization. Prerequisite: PHY 452, MTH 333.

**650-3, 651-3, 652-3 to 4 Electricity and Magnetism\***

Fundamental laws of electricity and magnetism presented from the viewpoint of field theory. Maxwell's equations, transient and steady state currents, electric and magnetic properties of matter, and electromagnetic radiation. Prerequisite: PHY 242; MTH 232, 233.

**660-4 Introduction to Quantum Mechanics**

Mathematical structure of quantum mechanics. Applications to selected one- and three-dimensional problems with emphasis on atomic structure. Prerequisite: PHY 260, 372; MTH 333.

**661-4 Introduction to Solid State Physics**

Selected properties of solids and their quantitative explanation in terms of simple physical models. Applications of quantum mechanics to solids. 3 hours lecture, 2 hours lab. Prerequisite: PHY 316, 460, or 660.

**662-4 Introduction to Nuclear Physics and Relativity**

Special theory of relativity. Nuclear radiation, nuclear properties, nuclear transformations, and elementary particles and interactions. Prerequisite: PHY 460 or 660.

**673-3, 674-3, 675-3 Mathematical Physics**

Survey of the field of mathematical physics including vector analysis, analytical mechanics, electromagnetism, and thermodynamics.

**680-3, 681-3, 682-3 Introduction to Theoretical Physics**

Classical theoretical physics with emphasis on mechanics, electromagnetic field theory, and mathematical techniques. Prerequisite: PHY 372, 452; MTH 333.

**694-3 Advanced Physics Laboratory**

Selected laboratory problems and experiences in experimental physics at the advanced level. Students maintain a high level of independence in the investigations.

**700-3 Principles of Instruction in Physics\***

Survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For physics majors only, or departmental approval required.

**704-2, 705-2, 706-2 Philosophy of Physics\***

Various areas of physics are studied with regard to their historical and philosophical basis in modern physical theory.

**710-3, 711-3, 712-3 Quantum Mechanics**

Introduction to nonrelativistic quantum mechanics. Schrodinger's equation. Matrix mechanics. Applications to simple atomic and nuclear systems.

**720-4 Statistical Physics**

Laws of thermodynamics and the development of statistical mechanics. Macroscopic and microscopic applications to physical systems. Classical and quantum statistics. Fluctuation phenomena.

**728-2 to 3 General Relativity**

Principles of the general theory of relativity with applications to gravitation and cosmology. Review of special relativity and tensor analysis. The equivalence principle, curvature, and Einstein's field equations. Prerequisite: PHY 260, 372, 452; MTH 333. Corequisite: PHY 481 (681) or permission of instructor.

**729-2 to 3 General Relativity**

Continuation of PHY 728. Applications of general relativity. Gravitational radiation and gravitational collapse. Prerequisite: PHY 728. Corequisite: PHY 482 (682).

**730-3, 731-3, 732-3 Solid State Physics**

Introduction to the physics of solids. Lattice dynamics; thermal, electrical, and mechanical properties. Free electron and band theories of solids.

**751-4 Atomic Spectra and Structure**

Modern theory of the atom and quantum mechanical treatment of the origin of atomic and X-ray spectra.

**770-3 Selected Topics**

Titles vary.



**780-3, 781-3, 782-3 Plasma Physics**

Introduction to plasma physics. Motion of charged particles in electric and magnetic fields. Magneto-ionic theory, continuum equations, the Vlasov equation, the Boltzmann equation, and the BBGKY equations.

**799-1 to 5 Minor Problems**

Students pursue topics on a tutorial basis. Cannot be used for thesis credit.

**800-0.5 Seminar**

Scheduled discussions of current problems in physics. Centered around student presentations.

**899-1 to 15 Research**

Gives students opportunities for study or laboratory work in a specialized field of interest. For thesis preparation. May be repeated.

\*Not available for graduate credit toward the M.S. degree in physics.

## Physiology and Biophysics/P&B

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**501-5 Fundamentals of Human Physiology I**

First half of course in human physiology. Topics include homeostasis; cell, nerve, and muscle function; nervous system regulation and integration; and cardiovascular and circulatory mechanisms.

**502-5 Fundamentals of Human Physiology II**

Second half of course in human physiology. Subject areas include metabolism; gastrointestinal, pulmonary, renal, and reproductive functions; acid-base regulation; and endocrine regulation and integrative mechanisms.

**503-4 Physiology of Disease**

Inadequate or inappropriate physiological responses and their consequences. Emphasis on applications of physiological principles. Prerequisite: P&B 501, 502 or equivalent.

**601-5 Physiology and Biophysics of Cells and Systems I**

(Listed jointly with BMS 852.) Principles governing cellular steady state; biophysical basis of nervous system information; muscle contractility and excitation-contraction coupling; biophysical basis of heart excitation and contraction; cardiovascular physiology of the heart; and pulmonary physiology. Prerequisite: PHY 111, 112, 113, 210, 211 or 240, 241, 242 or CHM 456.

**602-4 Physiology and Biophysics of Cells and Systems II**

(Listed jointly with BMS 853.) Epithelial solute and water transport; the control of intracellular pH and role in cellular growth; gastrointestinal mucosal transport; hormonal adaptation; and muscle energetics and exercise. Prerequisite: P&B 601.

**642-3 Introductory Neurophysiology**

Physiological mechanisms that subserve the functions of the nervous system. Topics include the biophysics of neuronal information, intercellular communications, motor control, sensory systems, and developmental neurobiology. Prerequisite: BIO 105 and CHM 101 or equivalent.

**699-1 to 4 Special Problems in Physiology**

Enables students to explore potential careers in physiology. Varies from working on an ongoing physiological research project to historical survey related to a completed research project.

**701-1 to 5 Selected Topics in Physiology**

A selected area is discussed in greater detail than in the basic courses (P&B 702, 703). Some topics may include laboratory. Prerequisite: P&B 702, 703, or permission of instructor.

**702-6 Basic Human Physiology I**

Homeostasis, cell function, muscle action, nervous system integration, and circulation. 4 hours lecture, 2 hours lab, conference. Completion of one year each of biology, chemistry, and physics required.

**703-7 Basic Human Physiology II**

Negative feedback regulation; metabolism; gastrointestinal, pulmonary, renal, and endocrine functions; and integrative functions. 4 hours lecture, 2 hours lab, conference. Prerequisite: P&B 702.

**720-3 Neurophysiology**

(Listed jointly with BMS 902.) Topics address the representation, processing, and transmission of neuronal information, and the role of neuronal circuits in motor control and sensory systems. Prerequisite: P&B 601, 602, or permission of instructor.

**731-3 Perinatal Cardiovascular Physiology**

(Listed jointly with BMS 854.) Functional development of the cardiovascular system, in particular the heart, from the fetus to the newborn. Both normal and patho-physiological function is addressed. Prerequisite: P&B 702, 703, BMS 850, 851, or equivalent or permission of instructor.

**732-3 Control Mechanisms of the Cardiovascular System**

(Listed jointly with BMS 855.) Autonomic nervous system control of heart and vessels including cranial and spinal control, responses to stress, and pathology of the control system. Prerequisite: P&B 702, 703, or permission of instructor.



**741-3 Pulmonary Physiology**

(Listed jointly with BMS 857.) Survey of the respiratory, vascular, and biochemical mechanisms involved in transport of O<sub>2</sub> and CO<sub>2</sub> from atmosphere to cells. Nonrespiratory functions of the lung are also discussed. Prerequisite: P&B 702, 703, or permission of instructor.

**761-3 Gastrointestinal Physiology**

(Listed jointly with BMS 859.) Survey of gastrointestinal physiology emphasizing integrative mechanisms of motility, secretion, and absorption. Prerequisite: P&B 703 or permission of instructor.

**771-3 General Endocrinology**

(Listed jointly with BMS 860.) Survey of endocrinological mechanisms and their role in integration of body function. Prerequisite: P&B 703 or permission of instructor.

**783-5 Physiological Aspects of Exercise**

(Listed jointly with BMS 864.) Integration of physiological mechanisms involved in exercise. Cellular, neuromuscular, cardiovascular, and respiratory changes are discussed with relationship to exercise performance. 4 hours lecture, 2 hours lab, student recitation. Prerequisite: P&B 702, 703 or equivalent, or permission of instructor.

**800-2 Seminar**

Students organize and present material to colleagues and faculty.

**899-2 to 18 Graduate Research**

Supervised thesis research.

## Political Science/PLS

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**505-4 Comparative Marxist Theory**

Critical examination of the chief theories developed by Marx, Engels, Lenin, Stalin, Mao Tse-tung, Castro, and various revisionists. Emphasis on Soviet and Chinese ideologies.

**506-4 The Marxist-Christian Dialogue**

(Listed jointly with REL 506.) Examination and evaluation of the developing intellectual exchange between Christian and Marxist points of view.

**526-4 Government of Ohio**

Organization and functions of the government of Ohio with emphasis on development, social structure, legal status, electoral processes, and fiscal problems.

**528-4 Political Aspects of Urban Development**

Institutional and political context of planning; laws, governmental structures, and procedures; urban politics.

**539-4 United States Health Policy**

Critical review of important political, social, and economic causes and consequences of health policies in the United States.

**540-4 Constitutional Law**

Cases in which provisions of the Constitution have been judicially interpreted; federal systems; separation of powers; and limits on government.

**541-4 Civil Liberties**

Cases and related materials on the Bill of Rights and the Fourteenth Amendment with emphasis on the First Amendment freedoms.

**542-4 The American Criminal Justice System**

Survey of the American criminal justice system, concentrating on political aspects. Topics include police, judges, attorneys, Supreme Court decisions, crime, and public opinion.

**546-4 Public Personnel Administration**

Methods of employment, training, compensation, and employee relations in various levels of civil service; organizations of public employees.

**547-4 American Public Policy Analysis**

The nature and classification of public policy. Emphasis on fragmentation, incrementalism, and bargaining as means of policy development. Impact of citizens on public policy evaluation. Examination of illustrative public policy areas.

**552-4 Ethnic Politics**

Compares ethnic identity and politics in Western societies, including the United States, Canada, Great Britain, and France. Topics include minorities and the welfare state, affirmative discrimination, and black politics in the United States.

**554-4 Governments of Eastern Europe**

Introduction to the governments and politics of Eastern Europe, particularly since World War II. Includes current developments in Poland, Czechoslovakia, East Germany, Hungary, Rumania, Bulgaria, and Yugoslavia.

**556-4 Politics and Society in France**

Examines the historic interaction of French culture and politics. Topics include the growth of the French nation and state, French society, the nature of modern politics and institutions, and France's role in world affairs.

**562-4 Political System of Japan**

Analysis of the political structures and processes of Japan with emphasis on the dynamic factors of socioeconomic development.

**564-4 Contemporary African Politics**

Political processes and governmental institutions of sub-Saharan Africa with emphasis on dynamics of political development and socioeconomic change. Comparative analysis of selected African political systems.



**566-4 Politics of the Middle East**

Introduction to governments and politics of the Middle East with emphasis on cultural and historical background and the Arab-Israeli conflict.

**567-4 Political System of China: the People's Republic**

Analysis of political structures and processes of Communist China; focus on dynamic factors of socioeconomic and political development.

**572-4 International Organization**

Analysis of developing structures and functions of the United Nations and other international organizations, and concepts relating to world government.

**580-4 American Foreign Policy**

The role of the United States in contemporary international politics and the relationship of the domestic political system to that role. Discussion of current problems.

**581-4 National Security Politics**

Study of U.S. national defense and security policy process and the major strategic issues facing the U.S. government. Prerequisite: PLS 200.

**583-4 Soviet Foreign Policy**

Study of the historical and ideological origins of Soviet foreign policy, with particular emphasis on U.S./Soviet relations, and Soviet involvement in the Third World. Prerequisite: Completion of political science major core courses or permission of instructor.

**599-1 to 4 Studies in Selected Subjects**

Problems, approaches, and topics in the field of political science. Topics vary.

**601-4 Classical and Medieval Political Thought**

(Listed jointly with PHL 631.) Critical examination of political ideas from 500 B.C. to A.D. 1500 with emphasis on Plato, Aristotle, Cicero, St. Augustine, St. Thomas Aquinas, Luther, Calvin, and Machiavelli.

**602-4 Political Thought: Hobbes to Mill**

(Listed jointly with PHL 632.) Critical examination of political ideas from 1600 to 1900 with emphasis on Hobbes, Locke, Rousseau, Montesquieu, Hume, Burke, Hegel, Bentham, Marx, and Mill.

**603-4 Twentieth-Century Political Thought**

Critical examination of the ideas of twentieth-century political theorists. Emphasis on the nature, methodology, evaluation, existing condition, and future of political thought.

**607-4 Seminar in Political Theory**

Readings, research, reports, and discussion on selected theorists, topics, and problems.

**611-4 Seminar in Methodology**

Techniques and methods of research in political science; application to individual projects and research designs.

**612-4 Topics in Empirical Political Analysis**

Selected topics of methodological or analytical concern in contemporary political research.

**625-4 Seminar in Metropolitan Studies**

Intensive interdisciplinary treatment of metropolitan studies. Reading and discussion on pertinent theory, methodology, and case studies. Practical research by students.

**627-4 Urban Policy Analysis**

Selected urban problems and their relationship to the political environment; explores program design and evaluation, and the use of social indicators.

**629-4 Urban Communications Theory**

(Listed jointly with COM 629.) Processes and institutions by which individuals and groups communicate in an urban environment. Model of an urban communication system developed by interdisciplinary systems approach.

**630-4 Seminar in American Politics and Government**

Selected topics related to American political institutions and processes. Emphasis on readings, discussion, and research.

**633-4 Public Opinion**

Opinion formation in American politics; relationship of opinion to public policy; voting behavior in American elections; role of mass media and political interest groups in the policy process; and development of political attitudes and values.

**634-4 Political Socialization**

Political attitude development; acquisition of basic political orientations and values from childhood through adolescence and adulthood; and investigation of the role of various socializing agents.

**643-4 Administrative Law Procedure**

Study of the law controlling the process by which policy is made and administered by public agencies. Topics include policy formulation and budgeting, legislative delegation, administrative agencies, rule-making, and adjudication.

**645-4 Comparative Public Administration**

Comparative study of public administration, emphasizing characteristics and roles of public bureaucracies in Western, non-Western, developing, and developed nations.

**646-4 Public Budgeting**

Examination of the major phases of the governmental budget cycle; types of budget; budgetary reform; economic and public policy impact of government budgeting; decision-making; and legislative-executive relations in budget formation and implementation.



**647-4 Seminar in Public Administration**

Selected national, state, and local problems with emphasis on legal scope of administrative power and on research methods used by staff agencies. Prerequisite: PLS 345 or permission of instructor.

**649-4 Public Organization Theory**

Theory of administration and decision making of public organizations, principal schools of thought, and impact of structure, behavior, and public policy. Prerequisite: PLS 345.

**650-4 Political Institutions in Primitive Societies**

(Listed jointly with ATH 650.) Study of that part of the culture of primitive societies that is recognized as political organization. An attempt is made to show how in less complex (primitive) societies, new local communities come into being through fission.

**651-4 Comparative Government Policy**

An examination of the differences in policy outcomes in relation to variations in governmental structures and political processes in West European political systems and the U.S.; policy areas examined include social welfare, taxation, civil rights, and foreign policy.

**653-4 Political System of the Soviet Union**

Analysis of the Soviet system with emphasis on development of the Communist Party.

**660-4 Seminar on Comparative Political Systems**

Readings, research, reports, and discussion on selected topics and problems.

**670-4 Seminar in International Relations**

Readings, research, reports, and discussion on selected topics and problems.

**671-4 International Law**

Study of rules governing the conduct of international politics with emphasis on their relevance to current world problems.

**686-4 Chinese Foreign Policy**

Policy dynamics and structure as well as external policies and international relations of the People's Republic of China.

**690-1 to 4 Independent Reading**

Supervised individual readings on selected topics.

**691-1 to 4 Independent Research**

Supervised individual research on selected topics.

**692-1 to 4 Independent Field Experience**

Supervised individual projects. May involve intern programs in local government or other special programs.

**693-1 to 4 Contemporary Problems**

Advanced study in selected topics that frequently include new developments in the methodology or subject matter of the various subfields of the discipline.

**694-1 to 4 Special Topics**

Study of particular political problems of contemporary significance.

**Professional Psychology/PSI**

All PSI courses may be taken for a letter grade or pass/unsatisfactory.

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**811-3 History and Systems of Psychology**

Historical and philosophical precursors of psychology's knowledge base. Early philosophers' and recent thinkers' views of epistemology, existentialism, consciousness, and behavior.

**812-3 Memory, Cognition, and Individual Differences in Information Processing**

Structure of human cognitive systems. Relationship of individual differences, including cognitive styles and intelligence test performance, and cognitive structure and processing. Applications to clinical and training problems.

**813-3 Learning and Motivation**

Principles of behavior theory emphasizing human behavior. Topics include Pavlovian principles and emotional states, operant principles, cognitive variables, and the biological constraints on learning.

**814-3 Advanced Statistics and Experimental Design**

Strengths, limitations, and applications of research designs. Statistical theory and principles of descriptive and major parametric and nonparametric inferential procedures. Develops ability to critically review research, demonstration, and evaluation results. Lecture, lab, field work.

**815-3 Research Design**

Research issues in correlation and prediction. Computerized data processing and introduction to program evaluation, operations, and system analysis. Research issues relevant to professional psychology including single subject, nonintrusive research methods. Lecture, lab, field work.

**816-3 Measurement Theory and Techniques**

Emphasis on knowledge of measurement theory, test construction, survey methods, and questionnaire techniques. Study of reliability and validity of measurement devices. Familiarity with APA standards for tests and test usage.

**830-3 Physiological Psychology**

Physiology of body systems including endocrine, nervous, musculoskeletal, respiratory, cardiovascular, reproductive, and renal systems. Autonomic and endocrine regulation of body systems in homeostasis and during stress.



**831-3 to 6 Neuropsychology**

Neurophysiology emphasizing major CNS structures and tracts, location and function of cranial nerve nuclei and cranial nerve pathways. Organization of CNS vasculature and localization of function. Lecture, lab, field work.

**832-3 Psychopharmacology and Nutrition**

Chemical structure of primary CNS neurotransmitters. Classification, chemical structure, effects, and side effects of psychoactive drugs. Basic principles of nutrition and behavior correlates of imbalance in nutritional status.

**833-3 Psychopharmacology**

Interaction of genetic and environmental influences on behavior; inheritance of dominant, recessive, sex-linked characteristics; genetic influence in psychopathology, intellectual function, and personality development; and genetic counseling.

**850-3 Theories of Personality**

Personality and behavior in a clinical setting. Psychodynamic, phenomenological, dispositional, and behavioral theories of personality. Role of cognition, person-situation interaction, extroversion, self-esteem, and achievement motivation in therapy.

**851-3 Psychopathology**

Covers definition and models of psychopathology including biochemical, genetic, dynamic, and behavioral dimensions; diagnostic systems, differential diagnosis, and treatment selection. Variables affecting individual and group functioning also are covered.

**852-3 Human Development: I**

Conceptualizations of infancy, early childhood, and adolescence including physical, cognitive, intellectual, social, and interpersonal development. Lecture, lab, field work.

**853-3 Human Development: II**

Topics span early adulthood to old age including death and dying. Typical stresses and/or life tasks are discussed for each period, including biological, sociological, and interpersonal factors. Lecture, lab, field experience.

**870-3 Social Psychology**

Theories and experimental findings regarding determinants of social behavior including social motivation, attribution theory, perception of people, attitude theories, group processes, interpersonal attraction, and environmental determinants of behavior. Lecture, lab, field work.

**871-3 to 5 Social Deviancy**

Study of juvenile justice system, delinquency, criminal behavior, and antisocial behavior. Discussion of familial social factors that contribute to deviant behavior, with emphasis on children and adolescents.

**872-3 Social Systems**

Family as an institution: socioeconomic status, rural-urban, ethnic, cultural, and religious. Sex and age roles. Socialization practices and patterns of parenting. Lecture, lab, field work.

**873-3 Influence of Economic Systems on Behavior**

Introduction to basic economic concepts and models. Effects of economic policy on dysfunctional human behavior and family economics as it relates to behavioral problems, along with class and racial differences.

**874-3 Psychology of Minorities**

Effects of prejudice, social policies, housing desegregation, and language styles on work and other relationships. Problem areas, strengths of minorities. Managing prejudice within the professional/client relationship. Lecture, lab, field work.

**875-3 Conflict Resolution**

The affective, cognitive, and behavioral components of conflict. Negotiating conflicts between individuals and within groups, including black/white, male/female, labor/management, and police/community. Management of aggression and hostage management. Lecture, lab, field work.

**876-3 to 5 Forensic Psychology**

Introduction to legal and criminal justice system. Study of criminal and civil law in relation to professional practice. Study of evidentiary procedures. Discussion of adversary procedures. May be taken for letter grade or pass/unsatisfactory.

**877-3 Organizational Psychology Processes**

Analysis and assessment of systems, management styles, work environments, stress and stress management, and executive assessment. Personnel relations, productivity, and human factors (human/machine interface) are considered. Lecture, lab, field work.

**878-3 Forensic Seminar**

Fundamental legal concepts and introduction to adversary and court systems; review of statutory and case law related to psychology, and relationship of psychology to civil and criminal law. Lecture, lab, field work.

**880-3 Chemical Dependency**

Incidence and prevalence of use and misuse of substances, with emphasis on addiction syndromes and stages of alcoholism/addiction. Theories of addiction/misuse and underlying personality dynamics and styles. Lecture, lab, field work.



**881-3 Health Psychology**

Techniques of therapy applied to populations whose problems arise from faulty lifestyles and not from serious psychopathology. Topics include stress management, weight control, and health maintenance. Lecture, lab, field work.

**882-3 Psychology of Disability: Mental Retardation**

The process and psychological and sociocultural effects of prolonged and continuous disability including symptomatic and role dysfunction. Institutional and "deinstitutional" processes and effects; family, community, and "alternative" services. Lecture, lab, field work.

**911-3 Basic Psychotherapeutic Methods: I**

Process of client designation, problem identification, and functional analysis. Client expectancy, establishing relationships, developing information base for linking, consultation, and referral. Interviewing styles and types. Lecture, lab, field work.

**912-3 Cognitive Assessment**

Basic intelligence and aptitude assessment devices and interface with intervention plans. Biological, individual, and social system influences, and minority and social class issues in assessment. Lecture, lab, field work. Titles vary.

**913-3 to 5 Personality Assessment: Objective**

Study of circumscribed personality theories and nonpathological aspects of personality measurement and predicting behavior; individual differences as related to personality. Knowledge of tests for measurement of personality; their use and limitations. May be taken for letter grade or pass/unsatisfactory.

**914-3 Personality Assessment: Projective**

Objective and projective techniques; how and when to administer, score, interpret, and convey results meaningfully. Emphasis on integrating these results into the clinical situation. Lecture, lab, field work.

**915-3 Neuropsychological Assessment**

Basic techniques of formalized neuropsychological batteries and integration of neuropsychological assessment with clinical neurology/neuropathology in children and adults; inpatient and outpatient cases. Lecture, lab, field work.

**916-3 Child Therapy**

Behavior disorders of children and adolescents. Behavior therapy, group therapy, family therapy, milieu therapy, and pharmacotherapy as intervention techniques. Problems associated with the treatment of children. Lecture, lab, field work.

**930-3 Basic Psychotherapeutic Research**

Strategies and problems unique to psychotherapy research. Outcome research in psychotherapy. Relation of outcomes to diagnosis and survey of predictors of success in psychotherapy.

**931-3 Basic Psychotherapeutic Methods and Concepts: II**

Freud and development of psychoanalysis, neo-Freudian, and ego psychology schools. Structural aspects, techniques, and evaluation of psychoanalysis including stages of development, the unconscious, and psychodynamics. Lecture, lab, field work.

**932-3 Crisis Intervention**

Theory and definition of crisis. Individual and community support systems and crisis programs in hospitals, suicide and crisis centers, and office, family, and other settings. Lecture, lab, field work.

**933-3 Behavioral Interventions**

History and assumptions of behavior therapy. Assessment for behavioral intervention techniques of behavior therapy emphasizing cognitive approaches. Intervention in problem areas with high probability outcomes. Lecture, lab, field work.

**934-3 to 5 Brief Psychotherapy**

Study and discussion of problem-focused, time-limited interventions. Study of concepts and techniques; use of programmatic and group methods.

**935-3 Family Therapy**

Organization and structure of the family and common problem areas. Review of theories of family therapy and treatment strategies of marital and sexual dysfunctions. Lecture, lab, field work.

**936-3 Humanistic Intervention**

Theory, technique, and research base of client-centered psychotherapy. Theory of assessment procedures and techniques of transactional analysis. Gestalt psychotherapy and selected existential approaches. Lecture, lab, field work.

**937-3 Psychophysiological Interventions**

Clinical applications of psychophysiology and evaluation of psychophysiological change. Evaluation of biofeedback techniques in the treatment of psychological and psychophysiological disorders. Biofeedback in clinical practice. Lecture, lab, field work.

**938-3 Group Psychotherapy**

Background, development, and theory of small groups. Effective leadership techniques and procedures for planning, conducting, and evaluating group interaction and progress. Lecture, lab, field work.



**939-3 to 5 Child Psychopathology**

Classification and diagnostic systems related to children. Behavioral problems and related problems in life adjustment, learning, and adaption to peers. Current theories of etiology and treatment interventions. May be taken for letter grade or pass/unsatisfactory.

**941-3 Consultation**

Consultation as used for analysis and change in human service settings, business, and industry. Learning principles used to change public, community, group, and individual behavior. Lecture, lab, field work.

**942-1 to 5, 943-1 to 5, 944-1 to 5, 945-1 to 5 Selectives**

Intensive treatment of subject materials or techniques providing students with increased experience or specialization in specific interventions, assessments, concepts, or approaches. Topics vary.

**946-1 to 5, 947-1 to 5, 948-1 to 5, 949-1 to 5 Selectives**

Intensive treatment of subject materials or techniques providing students with increased experience or specialization in specific interventions, assessments, concepts, or approaches. Topics vary.

**954-3 Health Psychology: II**

Psychological theory and applications in general health, medical, surgical, and health delivery systems. Psychological interventions in specific health problems and in dealing with terminal illness and death. Lecture, lab, field work.

**955-3 Stereotype and Prejudice: Geriatric Psychology**

Psychological and social derivation of stereotypes and prejudice and their maintenance. Techniques for assessing and modifying stereotypes and prejudice including self-awareness, group, educational, and environmental approaches. Lecture, lab, field work.

**956-1 to 5 Group Interventions**

Intensive treatment of subject materials or techniques providing students with increased experience or specialization in specific interventions, assessments, concepts, or approaches.

**968-3 to 5 Special Interventions**

Study and discussion of unique programs for focalized psychological problems (e.g., phobias, treatment of psychopaths, and multiple personalities) and other specialized intervention techniques not covered in previous intervention courses. Titles vary.

**970-3 Individualized Service Planning and Quality Assurance**

Practicum in developing, monitoring, and reviewing individualized service-by-objective plans and programmatic service plans. Peer review, criteria development, and other quality assurance methods are applied. Lecture, lab, field work.

**971-3 to 5 Community Psychology**

Study of influence of community on behavior, status of mental health centers, and history of these developments. Study of integration of psychology and psychological services into community. Discussion of community-based groups, Alcoholics Anonymous, and Gamblers Anonymous.

**972-3 Service Systems: Planning, Management, and Evaluation**

Problem identification, analysis, intervention management, planning, and evaluation related to systems of service, organization, and support. Quality assurance, operations theory, and evaluation applied to service delivery. Lecture, lab, field work.

**973-1 to 5 Professional Practice Seminar**

Study of the establishment and maintenance of independent or small group practice. Discussion of issues related to practice management.

**980-1 to 3 Professional Development**

Issues relevant to students' development as professional psychologists including professional involvement, legal and legislative issues, professional ethics and standards, and relation with other professional groups.

**982-1 to 5 Selective**

Intensive treatment of subject materials or techniques providing students with increased experience or specialization in specific interventions, assessments, concepts, or approaches. Topics vary.

**995-1 to 5 Directed Readings: Research**

Individualized course of readings completed under faculty supervision.

**996-1 to 5 Directed Research**

Research or evaluation performed under faculty supervision.

**997-1 to 6 Supervised Experience**

Faculty supervised clerkship, field placement, or other isolated circumscribed professional experience.

**998-1 to 5 Directed Projects**

Project of excellence or other professional project carried out with faculty approval and supervision.

**999-12 Internship**



## Psychology/PSY

Note: See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 503-4 *Psychology of Health Behavior*

The contributions of psychology of health care. Focus is theoretical and practical, emphasizing the integration of physiological and psychological knowledge. Prerequisite: PSY 111, 112.

### 504-4 *Industrial and Organizational Psychology*

Scientific psychological principles, procedures, and methods applied to human behavior in organizations. Prerequisite: PSY 111, 112.

### 506-4 *Engineering Psychology*

(Listed jointly with BME 506.) Introduction to the study of human factors in the design and operation of machine systems. Prerequisite: PSY 111, 112.

### 507-4 *Tests and Measurements*

Introduction to the construction and use of attitude scales, aptitude and ability tests in organizational settings with emphasis on the use of standard tests. Prerequisite: PSY 111, 112; MTH 127.

### 508-4 *Environmental Psychology*

Effects on behavior of environmental factors such as crowding, noise, pollution, temperature, lighting, and architecture. Also covers applications of psychological knowledge and techniques in dealing with current environmental problems. Prerequisite: PSY 111, 112.

### 509-4 *Behavior Modification: Method and Theory*

Principles of conditioning as related to problems in human adjustment. General principles of the psychology of learning are illustrated with cases of interest to a wide variety of helping professionals (e.g., psychologists, educators, social workers, nurses, and speech therapists). Prerequisite: PSY 111, 112.

### 510-4 *Psychology of Women and Men*

The current state of research evidence about sex differences in all aspects of human behavior as well as patterns of public attitudes about the natures and proper roles of men and women are examined. Prerequisite: PSY 111, 112.

### 511-4 *Abnormal Psychology*

An overview of the facts and theories pertaining to abnormal behavior. Topics include classification and diagnosis, causes, and treatment of abnormal behavior. For nonmajors only. Prerequisite: PSY 111, 112.

### 521-4 *Cognition and Learning*

Cognitive processes with emphasis on learning and memory systems. Topics include short-term memory, retrieval mechanisms, conceptual structures and skills tests (IQ), mnemonic techniques, and amnesias. Prerequisite: PSY 111, 112.

### 531-4 *Theory and Research in Personality*

Review of contemporary theories of personality and associated research methodology.

### 541-4 *Developmental Psychology*

Theory, research, and issues in the study of development of children and the young of other species.

### 551-4 *Experimental Social Psychology*

Current theories and experimental findings regarding the determinants of social behavior.

### 561-4 *Learning and Motivation*

Introduction to experimental findings and contemporary theories of conditioning, learning, and motivation.

### 571-4 *Perception*

Physiology and psychology of the phenomena of sensation and perception.

### 591-4 *Physiological Psychology*

Physiological mechanisms of behavior; emphasis on motivational systems and learning.

### 592-4 *Advanced Physiological Psychology*

Physiological mechanisms of behavior with emphasis on motor and sensory systems. Prerequisite: PSY 591.

### 600-4 *Advanced Research Design and Quantitative Analysis*

Use of factorial designs and multivariate tests in psychological research. Prerequisite: PSY 300.

### 601-4 *Advanced Experimental Design: Packaged Computer Programs*

The use of canned computer programs such as SPSS, SAS, and BIOMED in the design, analysis, and interpretation of behaviorally oriented research. Prerequisite: PSY 300, 400.

### 619-4 *Advanced Topics in Physiological Psychology*

Detailed examination of selected areas in cognition and learning. Prerequisite: PSY 391. (Previously listed as PSY 691.)

### 621-4 *Advanced Topics in Cognition and Learning*

Detailed examination of selected areas in cognition and learning. Prerequisite: PSY 321.

### 625-4 *Human-Computer Interface*

Relationship of human cognitive, perceptual, and language processes to the effective operation of computer systems. Review of research and theory. Prerequisite: PSY 321, CS 142.



**629-4 Interpersonal Relations Skills**

Surveys the scientific literature on conformity, obedience, interpersonal choice, and verbal and nonverbal communication; relates this information to enhancement of everyday communication and interaction; and introduces techniques for developing basic interpersonal skills. Prerequisite: PSY 331 or 351.

**631-4 Advanced Theory and Research in Personality**

Review of selected topics in personality. Focuses on selected personality constructs and their measurement (i.e., need for achievement and self-concept) as well as situational determinants of behavior. Prerequisite: PSY 331.

**632-4 Practicum in Applied Psychology**

Provides an opportunity to work in an applied psychological setting under supervision. The setting will be consistent with the individual student's interests (mental health agency, industrial or organizational setting, etc.).

**633-4 Exceptional Child**

Problems of retarded, gifted, physically handicapped, and emotionally disturbed children.

**635-4 Abnormal Psychology**

Causes, symptoms, influence, and prevention of abnormal behavior and their relation to normal behavior. Field trips to appropriate local institutions.

**636-4 Behavior Modification Method and Theory**

The principles of conditioning as they relate to problems in human adjustment. The general principles of the psychology of learning are illustrated with cases of interest to a wide variety of helping professionals (e.g., psychologists, educators, social workers, nurses, and speech therapists). Prerequisite: PSY 311 or 361 or 411 or permission of instructor.

**637-4 Behavior Modification**

Applications of psychological principles to a wide variety of behaviors. Prerequisite: PSY 331 or 411 (635) or permission of instructor.

**639-4 Theory and Research in Clinical Psychology**

Overview of contemporary clinical approaches, research techniques, and empirical data. Prerequisite: PSY 331, 411, or permission of instructor.

**641-4 Advanced Developmental Psychology**

Development of learning and cognition in children is covered in depth. Prerequisite: PSY 300, 341.

**643-4 Psychometrics**

The basic principles, problems, and techniques of psychological testing with emphasis on test construction, interpretation, and usage.

**644-4 Advanced Industrial Psychology**

Theories and research findings in selected topics in industrial psychology.

**647-4 Psychology of Aging**

Overview of the theoretical, methodological, and conceptual issues in the study of human aging. Focus is on current research and applied relevance. Prerequisite: PSY 111, 112, 341.

**650-4 Biofeedback: Research and Application**

Introduction to biofeedback in the context of general behavior theory of learning. Literature is surveyed. Topics include problems of methodology and experimental design, and application to problems in clinical psychology. Prerequisite: PSY 361.

**651-4 Advanced Topics in Experimental Social Psychology**

Detailed examination of selected areas of current research in social psychology. Prerequisite: PSY 300, 351.

**655-4 Psycholinguistics**

Experimental findings in the areas of animal communication and human language with emphasis on their implications for current theories of language. Includes production and reception of speech, acoustic signal, speech mechanism, personality and speech behavior, development and deficiencies, and communication.

**657-4 Psychology of Administrative Principles for Social Agencies**

The basic social psychological principles involved in administrative mental health and mental retardation programs. Focus is on factors governing application of those principles to communication, organization development, and supervision within the mental health/mental retardation field.

**661-4 Advanced Topics in Learning and Motivation**

Continued study of conditioning, learning, and motivation. Prerequisite: PSY 300, 361.

**665-4 Information Processing**

(Listed jointly with BMS 905.) Experimental findings in animal and human memory with emphasis on their implications for current theories of memory.

**671-4 Advanced Topics in Perception**

Emphasis on modern controversial issues and theories. Prerequisite: PSY 300, 371.

**675-4 Signal Detection Theory**

Presents signal detection theory in the context of Thurstonian scaling and statistical decision theory. Studies the application of signal detection theory in various areas of psychology including psychophysics, memory, physiology, and psycholinguistics. Prerequisite: PSY 300.



**678-4 Animal Behavior**

(Listed jointly with BIO 678.) Physiology, phylogeny, and ontogeny of behavior. Prerequisite: PSY 111, 112 or 300; or BIO 111, 112, 114; or BIO 105, 106, 107.

**681-4 History of Psychology**

Major trends in the development of psychology from its beginning to the present.

**682-4 Theories and Systems in Psychology**

Comprehensive treatment of the historical antecedents for selected theories and systems in psychology.

**688-1 to 4 Seminar in Special Topics**

Topics vary.

**690-1 to 4 Independent Readings—Selected Topics in Psychology**

Topics vary. Graded pass/unsatisfactory.

**698-1 to 4 Independent Research**

Original problems for investigation.

**717-3 Molecular Biology of Learning and Behavior**

Modern molecular biological investigations of the process of learning and memory. Implications for the development of a molecular theory of memory processes are considered.

**721-4 Engineering Psychology**

Application of psychology to equipment design and human-machine relationships.

**725-4 Experimental Methods in Social Psychology**

The experimental method as it is applied to social psychological problems. Provides experiences in both laboratory and field techniques. Prerequisite: PSY 351 or permission of instructor.

**726-4 Attitude Structure and Change**

Attitude as a social psychological concept, including problems of measurement, empirical findings, and theoretical models. Prerequisite: PSY 351 or permission of instructor.

**727-4 Small Groups**

Current theory and research in selected areas of small groups, including communications, group norms and conformity, group structure, and leadership. Prerequisite: PSY 351 or permission of instructor.

**729-4 Interpersonal Relations**

A laboratory group for the study of interpersonal relations, in which the group determines the goals and the means of goal achievement and then proceeds toward the goal.

**731-4 Theories of Personality**

Contemporary theories of the development, organization, and dynamics of personality. Prerequisite: PSY 331.

**733-4 Community Psychology**

Seminar on policy formulation and programming for community-oriented approaches to mental health problems. Covers history, policy, and program development difficulties; social problems versus illness models of psychopathology and treatment, and preventive interventions.

**735-4 Systems Analysis and Organizational Change**

Overview of the systems approach to organizational diagnosis, planning, and intervention in human service organizations. Behavioral interventions are emphasized. Prerequisite: ABS 703, 721, 722, or permission of instructor.

**751-4 Proseminar in Human Factors Psychology I**

An in-depth review of major areas of human factors research. The areas reviewed in this course complement those areas reviewed in PSY 752. Prerequisite: PSY 721 or equivalent or permission of instructor.

**752-4 Proseminar in Human Factors Psychology II**

An in-depth review of major areas of human factors research. The areas reviewed in this course complement those areas reviewed in PSY 751. Prerequisite: PSY 721 or equivalent or permission of instructor.

**759-0 to 1 Seminar in Human Factors**

Discussions of topics in human factors.

**761-4 Human Learning Psychology**

Phenomena, principles, and problems of learning and retention.

**762-4 Advanced Learning**

Experimental findings in animal and human learning with emphasis on their implications for current theories in learning. Prerequisite: PSY 361 or permission of instructor.

**763-4 Advanced Motivation**

Experimental findings in animal and human motivation with emphasis on their implications for current theories of motivation. Prerequisite: PSY 361 or permission of instructor.

**766-1 Human Information Processing Laboratory**

Laboratory experiments in human information processing illustrating basic cognitive phenomena. Practical experience in measurement techniques and experimental design. Corequisite: PSY 665.

**771-4 Perception**

Selected problems in perception with emphasis on theoretical interpretations.



**773-4 Sensory Processes**

(Listed jointly with BMS 909.) The basic physiology of the senses and the peripheral nervous system. Emphasis on receptor mechanisms and neural coding processes. Prerequisite: PSY 371 or 391 or permission of instructor.

**775-4 Neuropsychology**

Intensive laboratory involvement with the instrumentation and surgical techniques used in physiological psychology including: GSR, EMG, EKG, and EEG recordings; animal behavioral changes produced by electrical stimulation of the brain and/or lesions of brain structures. Prerequisite: PSY 391, 392 or permission of instructor.

**776-3 to 4 Visual Science**

Study of visual systems including psychophysical measurement, temporal and spatial properties, display criteria, colorimetry, and visual system modeling.

**777-1 Visual Science Laboratory**

Laboratory experiments in visual psychophysics and perception illustrating phenomena studied in PSY 776. Practical experience in measurement techniques. Corequisite: PSY 776.

**785-4 Intermediate Statistics**

Statistical methods and interpretations encountered in experimental studies and presentations of behavioral data.

**873-4 Vestibular Function**

Role of vestibular organs in space orientation. Stimulus parameters, anatomy, neurophysiology, psychophysics, perception, performance, and motor responses are examined with special reference to aerospace vehicles.

**875-4 Psychoacoustics**

Advanced examination of auditory psychophysics and perceptual processes involving consideration of peripheral and central auditory physiology whenever possible.

**968-4 Manual Control and Psychomotor Skills**

Description of human control processes and their models. Analyses of human skills and skill typology. Prerequisite: PSY 665 or equivalent.

**991-4 Psychobiology of Stress**

The effects of psychological stress on neuroendocrine and other physiological systems are explored. The implications of these relationships for disease processes and human performance are discussed.

**Rehabilitation/RHB**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**670-1 to 3 Workshop in Rehabilitation**

Workshop courses to meet the needs of in-service rehabilitation professionals as well as providing courses on a one-time basis to meet special interest needs.

**700-4 Counseling: Severe Disability Foundations of Vocational Rehabilitation**

Introduces rehabilitation. Topics include history, philosophy, legislative bases, organizational structures, rehabilitation process and procedures, public and private sectors of rehabilitation, rehabilitation agencies, and professional issues and ethics.

**701-1 to 5 Counseling Theory and Practice**

Surveys the major theories of counseling and provides opportunities to develop the basic skills associated with the counseling process. Also addresses the key philosophical and ethical issues associated with the counseling profession.

**702-1 to 5 Medical Assessment**

Necessary terminology and knowledge of disabilities and disorders for understanding and interpreting medical reports. Symptomology, treatment, functional limitations, and other management aspects of specific disabilities encountered in the course of employment are covered. Titles vary.

**703-1 to 5 Applied Research in Rehabilitation**

Introduction to current rehabilitation research and rehabilitation program evaluation models.

**704-1 to 5 Psychological Adjustment: Severe Disability**

Psychological issues associated with specific disabling conditions. An in-depth review of the general adjustment process to disability and definitions of normality and abnormality. Prerequisite: RHB 701.

**705-1 to 5 Behavioral Assessment**

Surveys psychological tests and measurements with emphasis on attitude, interest, vocational, and personality tests. Understanding of basic principles and their application to counseling in various settings are stressed. Prerequisite: RHB 701.

**706-1 to 5 Special Techniques in Counseling the Severely Disabled**

Techniques of counseling individuals who are different by reason of disability. Includes counseling for adjustment to disability, problem solving, and motivation. Prerequisite: RHB 701, 702, 703.



**711-1 to 5 Vocational Evaluation and Job Placement Techniques**

The history, philosophy, theoretical basis, goals, function, and scope of vocational evaluation. Theories and principles concerning work and career development are also explored. Prerequisite: RHB 701, 705.

**720-3 Counseling: Severe Disability Case Management in Vocational Rehabilitation**

Develops specific case management skills in diagnosis, information processing planning, service arrangement, program monitoring, and job placement. Emphasis on case management techniques, ethics, consultation strategies, and specialized counseling skills development. Prerequisite: RHB 700, 702, 711 or permission of instructor.

**721-5 Prognostic Aspects of Vocational Evaluation**

Study of processes, principles, and techniques used to determine and predict work behavior and vocational potential. Consideration is given to adapting assessment tools and systems to clients' needs. Prerequisite: RHB 303, 701, 702, 703, 711.

**730-1 to 4 Epidemiology of Chemical Dependency**

Addresses the sociocultural influences associated with chemical dependency. Examines models of drug and alcohol use and the personal evolution of chemical dependency, and the ethical and legal ramifications germane to work in the drug abuse field. Prerequisite: RHB 701, 705; CNL 663, 863 or permission of instructor.

**731-1 to 4 Treatment Approaches in Chemical Dependency**

The theory and practice of a variety of treatment modalities, including in-patient and out-patient approaches, family interventions, and group techniques. Emphasizes systems approaches and holistic intervention strategies. Also covers self-help groups such as Alcoholics Anonymous and Al-Anon. Prerequisite: RHB 730 or permission of instructor.

**770-1 to 3 Independent Reading and Minor Problems in Rehabilitation**

Independent study in areas of interest to students but not readily available in any existing course.

**774-3 Selected Problems**

Examines techniques of rehabilitation applied to selected disability groups such as mental retardation, drug abuse, emotional disturbances, alcoholism, and cultural and social deprivation.

**775-1 to 4 Graduate Seminar**

Includes the study of community-related rehabilitation program efforts in terms of individualized systems analysis. Prerequisite: RHB 700, 701, 702, 704, 705, ED 751.

**801-2 to 10 Internship: Severe Disability**

Students spend approximately twenty to thirty hours per week in a selected rehabilitation setting performing assigned entry-level work consistent with the integration of skills, attitudes, and knowledge of rehabilitation counseling. Titles vary. Prerequisite: RHB 700, 701, 702, 711, 720, CNL 863.

**802-1 to 10 Internship II**

A culminating integrative experience for graduate rehabilitation counseling students. Students spend from twenty to thirty hours per week in a rehabilitation setting providing professional-level rehabilitation counseling and services to severely disabled clients. Titles vary. Prerequisite: RHB 704, 705, 706.

**811-5 Use and Interpretation of Vocational Evaluation Data**

Interpretation of evaluation data to client, rehabilitation personnel, and facility staff. Attention is given to vocational counseling, staff conferences, report writing, and follow-up. Prerequisite: RHB 701, 702, 703, 704, 711, 721.

**873-15 Internship—Vocational Evaluation**

Supervised practical experience in a vocational evaluation unit. Students concurrently spend two hours per week in an Organization and Management of VE Units seminar. Prerequisite: RHB 701, 702, 703, 704, 711, 721, 811.

**Religion/REL**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**500-3 Technology and Society**

Important developments in engineering and technology; their interrelations with society and human values as viewed in historical and contemporary perspective.

**501-4 Religion and Sexuality**

Analysis of the relation of religion to sexuality and related ethical issues.

**503-4 Space and Faith: Topics in Religion and Geography**

The interrelation of religious and geographical factors in selected cultures of East and South Asia.

**504-4 Religions in the Biblical Period**

Examination of selected religious movements and/or problems in the Biblical period and their interconnectedness and mutual influences.

**505-4 Topics in Biblical Literature**

Examination of selected aspects of Biblical literature from both literary and historical perspectives to explore the possible structures, functions, and meanings of this literature for its original community.



**506-4 The Marxist-Christian Dialogue**

(Listed jointly with PLS 506.) Examination and evaluation of the Marxist-Christian dialogue. Emphasis on such categories as hope, liberation, alienation, humanity, love, class struggle, transcendence, power, and change.

**509-4 Christianity**

An examination of the structures of religious experience that have shaped the development of Christianity in history. Institutional and ritual forms are investigated as systems of meaning against the backdrop of the general history of religions.

**510-4 Early and Medieval Western Religious Thought**

Survey of important themes in the religious thought of the major Western traditions. Selected readings from primary sources and secondary interpretations.

**511-4 Reformation and Modern Western Religious Thought**

Survey of important themes in the religious thought of the major Western traditions. Selected readings from primary sources and secondary interpretations.

**516-4 Judaism: Faith and People**

Judaism as a religious culture of a particular people is examined critically, historically, and phenomenologically.

**518-4 Contemporary Jewish Thought**

Examination of the major themes and issues in the works of contemporary Jewish thinkers (e.g., Borowitz, Herberg, Fackenheim, Kaplan, Rothschild, Heschel, Rubenstein, and Wiesel).

**520-4 Religion and Ethics in the Arts**

Analysis of the religious and ethical dimensions, themes, and problems presented in selected contemporary art forms (e.g., architecture, cinema, drama, literature, music, painting, and sculpture).

**525-4 Understanding Death**

Basic issues in death and dying using resources from human sciences and humanities in a religious perspective.

**530-4 Topics in American Religion**

Examination of selected topics in American religion to investigate basic religious structures and to explore the relationship of religious phenomena to their cultural context.

**540-4 Topics in Asian Religion**

Studies in the religious dimension of Asian cultures, with emphasis on historical, social, and aesthetic perspectives.

**546-4 Anthropology of Religion**

(Listed jointly with ATH 546.) Anthropological approach to the meaning and function of religion in social life and the nature of the thought or belief systems that gave rise to different forms of religious life. Emphasis on primitive and peasant societies. (Previously listed as REL 560.)

**549-4 Asian Religious Philosophy**

(Listed jointly with PHL 549.) Perennial themes in Asian cultures, such as individual, society, and cosmos; appearance and reality; time and history; and karma, freedom, and responsibility. Treatment of these themes in the philosophical traditions of Asian cultures.

**561-4 Religion and Society**

(Listed jointly with SOC 561.) Treatment of religion as a social institution. Examines the influence of religious ideas and organizations on other social institutions, and the influence of society on religion.

**563-4 Religion and Psychology**

An introduction to selected themes, issues, and problems in the interaction of religion and psychology. Differing points of view are considered.

**570-5 Studies in Ethics**

A special topics course for intensified study of the ethical dimensions of a particular religious tradition or for concentrated study in theoretical or practical ethical problems. Topics vary.

**578-4 Ethics and Medicine**

(Listed jointly with PHL 578.) An examination of the ethical issues confronting society in the area of medicine and health care, considered from the perspective of philosophical and theological ethics. Examples include ethics of abortion, euthanasia, experimental medicine, and behavior control.

**581-4 Philosophy of Religion: Contemporary Western Survey**

(Listed jointly with PHL 581.) Cross-disciplinary perspective on philosophical and religious schools of thought in the early twentieth century. Absolute and personal idealism, spirit, value, positivism and naturalism, history and culture, modernism and pragmatism, and religious consciousness and phenomenology.

**582-4 Philosophy of Religion: Process**

(Listed jointly with PHL 582.) Realism and the revolt against idealism. Cross-disciplinary analysis of major contemporary process philosophers and the implications of their thoughts for religion. Focus on Alfred North Whitehead.

**583-4 Philosophy of Religion: Secular**

(Listed jointly with PHL 583.) Cross-disciplinary analysis of modes of human awareness through which religious meaning is expressed (sensation, morality, beauty, reason, and human relations). Examination of presuppositions of contemporary secular religion in existentialism.

**600-4 Seminar in Religion**

Topics vary.



**610-4 Religious Themes in Literature**

(Listed jointly with ENG 660.) Intensive study of literary works in terms of significant and recurring religious themes and images as they can be traced in various cultures and literary traditions.

**617-4 Evolution, Religion, and Ethics**

(Listed jointly with BIO 617.) Introduction to the biological, philosophical, theological, and ethical aspects of evolution.

**619-3 Ethics in an Industrial Society: the Responsibility of Business in Society**

(Listed jointly with LAW 695.) Ethical responsibilities of business in light of political, moral, social, and religious considerations. Emphasis on analysis and evaluation of the changing framework of responsibilities facing both business organizations and their leaders.

**629-4 Foundations for Religion Studies**

Introduction to various methods used in religion studies and an application of these methods to concrete data.

**630-3 Teaching About Religion in the Public Schools**

(Listed jointly with ED 630.) Introduction to the historical background and court decisions pertaining to teaching about religion in the public schools, current ways that religion is taught in the public schools, and new experimental approaches to teaching about religion.

**631-4 Religion in American Life**

Development of religious thought and institutional life in the United States viewed in relation to American social change.

**641-4 Islam**

Study of the origin and development of Islam, including contemporary issues and problems.

**654-4 Age of Renaissance and Reformation**

Decline of European feudalism and rise of the nation-state; revival of culture and arts; and decline of Universal Church and growth of religious diversity. 1550-1648.

**670-1 to 6 Workshop**

Intensive study of selected problems (e.g., the teaching of religion in secondary school, medical ethics) to meet particular needs of participating students. Titles vary.

**694-3 to 4 Existentialism**

(Listed jointly with PHL 694.) Representative writers of the existentialist movement.

**701-2 to 4, 702-2 to 4, 703-2 to 4 Reading and Research in Religion**

Intensive research in specialized areas. Students must submit written proposals, with faculty approval, for acceptance in course.

**Social Work/SW**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**520-1 to 6 Workshops in Current Problems**

(Listed jointly with SOC 512.) Intensive study of a particular problem area using professionally qualified personnel from academia and the practice community. Titles vary.

**570-4 Community Welfare Agencies and Services**

Analysis of community social service agencies and generic social work interaction skills necessary to meet social welfare needs. 3 hours lecture, 1 hour field experience.

**580-4 Social Work Practice I**

Generic social work practice theory. Problem assessment, data collection, data analysis, interventive methods, and evaluation procedures are studied and simulated.

**581-4 Social Work Practice II**

Continuation of generic social work practice theory. Problem assessment, data collection, data analysis, interventive methods, and evaluation procedures are studied and simulated.

**599-1 to 4 Studies in Selected Subjects**

Problems, approaches, and topics in the field of social work. Topics vary. May be taken for letter grade or pass/unsatisfactory.

**662-4 Social Gerontology**

(Listed jointly with SOC 662.) Social aspects of aging. The needs of the population and society's response to those needs.

**663-4 Social Gerontology II**

(Listed jointly with SOC 663.) Explores in-depth concepts and issues related to aging. Prerequisite: SW 662 or equivalent experience.

**664-4 Racial and Ethnic Awareness in the Human Services**

Impact of racism and ethnicity on the delivery of human services. Examination of interpersonal relationships and institutional policies and procedures with an opportunity to develop strategies for change at both levels. Prerequisite: SW 270, 380, or equivalent.

**677-1 to 4 Seminar on Special Problems in Social Welfare Policy and Services**

The operation of the social welfare system in America; issues, trends, and problems. Topics vary.

**681-4 Generalist Practice with Individuals**

In-depth study of generalist, social work practice theory for the enhancement of social functioning of individuals.

**682-4 Generalist Practice with Groups**

In-depth study of generalist, social work practice theory for the enhancement of social functioning as small groups. 3 hours lecture, 1 hour field experience.



**683-4 Generalist Practice with Families**

In-depth study of generalist, social work practice theory for the enhancement of family social functioning.

**684-4 Generalist Practice with Organizations and Communities**

In-depth study of generalist, social work practice theory for the enhancement of social welfare organizations and communities.

Prerequisite: SW 570 or permission of instructor.

**690-4 Research Methods in Social Work I**

Evaluative research methodology. Criteria for intelligent consumption of research reports for relevance to social work practice. 3 hours lecture, 1 hour recitation.

**691-4 Research Methods in Social Work II**

Evaluative research methodology. Criteria for intelligent consumption of research reports. Evaluation of selected research reports for relevance to social work practice. 3 hours lecture, 1 hour recitation.

**694-2 to 4 Directed Studies in Social Work**

May be taken for letter grade or pass/unsatisfactory.

**777-1 to 4 Special Problems in Social Welfare Policy and Services**

Seminar in the operation of the American social welfare system: issues, trends, and services. Topics vary.

## Sociology/SOC

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**510-4 Sex and Gender Roles**

Cross-cultural sociological knowledge and theories concerning origin/nature of sex roles; stratification of sexes in various societies; sex roles in institutions of family, education, religion, politics, economics, and health; and other topics such as socialization and media.

**512-1 to 6 Workshop in Current Problems**

(Listed jointly with SW 520.) Intensive study of a particular problem area using professionally qualified personnel from the academic and community environments. Titles vary. May be taken for letter grade or pass/unsatisfactory.

**514-1 to 6 Workshop in Current Problems**

Intensive study of a particular problem area using professionally qualified personnel from the academic and community environments. Titles vary.

**520-4 Sociology of Deviant Behavior**

Extensive exploration of the various sociological approaches to the study of deviance and social disorganization with emphasis on contemporary sociological theory and research.

**532-4 Juvenile Delinquency**

Problems of definition and treatment of delinquency; preparation for further study and work with delinquents.

**540-4 Social Organization**

Theories and analysis of social organization in its historical and present context. Emphasis on the interrelationship between individuals, the family, and other institutions.

**541-4 Social Inequality**

Structures, theories, and consequences of social inequality with emphasis on the United States.

**550-4 Sociology of Occupations and Professions**

Investigation, analysis, and discussion of contemporary theories focusing on the relationship of the individual to work.

**560-4 Sociology of the Family**

Sociological analysis of family development over its life cycle, and the relationship of the family to society and the individual. Topics include courtship, marriage, parenthood, adulthood, and aging.

**561-4 Religion and Society**

(Listed jointly with REL 561.) Treatment of religion as a social institution, examining the influence of religious ideas and organizations on other social institutions, and the influence of society on religion.

**563-4 Sociology of Education**

The school as a social institution. Internal and external influences; structure of the school social system; and sociological issues affecting the school, such as social class factors and equality of educational opportunity.

**599-1 to 4 Studies in Selected Subjects**

Problems, approaches, and topics in the field of sociology. Topics vary.

**601-4 Selected Topics in Theory/Methods**

Topics vary.

**632-4 Penology**

Historical development and critical assessment of penal institutions. Field visits to selected institutions. Prerequisite: SOC 330 or 332 or permission of instructor.

**633-4 Internship in Corrections**

Supervised field experience in corrections (e.g., probation, parole, and jail). Course requires readings, a log, progress reports, and a paper synthesizing readings and field experience. Completion of 8 credit hours from SOC 330, 332, or 432, and permission of instructor required.

**639-4 Selected Topics in Problems/Deviance**

Topics vary.

**641-4 Industrial Sociology**

Cross-cultural analysis of industrialization; organization of relationships within industrial social groups.



**642-4 Race and Minority Relationships**

Intergroup, racial, and ethnic group relations, including the processes and consequences of conflict, prejudice, and discrimination.

**644-4 Urban Sociology**

Role of cities in past and present societies, the social and cultural implications of urban living, and problems associated with city life.

**646-4 Neighborhoods and Communities**

Examines the part the community and the neighborhood play in the social life of modern societies. What makes a "good" neighborhood? What makes a "good" community? These and other questions are addressed.

**661-4 Medical Sociology**

The social dimension of health and illness. Consideration of the patterns of disease, along with the organization, provision, and delivery of health care services.

**662-4 Social Gerontology**

(Listed jointly with SW 662.) Study of social aspects of aging, the needs of the aging population, and society's response to those needs.

**663-4 Social Gerontology II**

(Listed jointly with SW 663.) Continuation of social gerontology. Explores in-depth concepts and issues related to aging. Prerequisite: SOC 662 or permission of instructor.

**670-4 The Future of the Family**

Investigation, analysis, and discussion of contemporary research focusing on the family as a changing social institution.

**679-4 Selected Topics in Social Institutions**

Topics vary.

**681-4 Sociology of Small Groups**

Study of face-to-face interaction with emphasis on both intergroup and intragroup structure and processes.

**689-4 Selected Topics in Social Interaction**

Topics vary.

**690-2 to 4 Directed Studies in Sociology**

May be taken for letter grade or pass/unsatisfactory.

**701-2 to 4 Selected Topics in Sociology**

Topics vary. May be taken for letter grade or pass/unsatisfactory.

**720-4 Seminar in Social Deviance**

(Listed jointly with ABS 761.) Contemporary theories of deviant behavior from both an institutional and social psychological perspective, with emphasis on the relationship between social change and social disorganization. Prerequisite: SOC 320 or 520 or permission of instructor.

**Spanish/SPN**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**590-8 Foreign Language Institute**

For teachers of Spanish. Intensive experience designed, through total immersion, to improve language skills (conversation and composition) and to increase awareness of Spanish civilization and contemporary culture. Graded pass/unsatisfactory.

**602-4 The Spanish Novel of the Nineteenth Century**

Nineteenth-century prose works by Galdos and others.

**603-4 Advanced Studies: Language/Civilization**

Topics vary. Conducted in Spanish.

**611-4 Golden Age Drama**

Intensive readings of dramas by playwrights of the sixteenth and seventeenth centuries.

**612-4 Modern Drama**

Intensive readings of dramas by playwrights of the nineteenth and twentieth centuries.

**621-4 Cervantes**

Intensive study of the works of Cervantes, including *Don Quixote*, *novelas ejemplares*, *entremeses*, and longer dramatic works. Lectures, discussions, and oral reports on Cervantes and his time.

**631-4 Seminar in Spanish Literature**

Intensive study of selected topics in peninsular literature. Background lectures, oral reports, and discussions. Titles vary.

**632-4 Seminar in Spanish-American Literature**

Readings and reports in the novel, poetry, and drama of selected Spanish-American authors. Representative works of Borges, García, Márquez, Rulfo, Paz, Vargas Llosa, Sánchez, and others.

**641-4 Contemporary Spanish Literature**

Readings in the novel, poetry, and drama of major Spanish writers in the post-Civil War period.

**642-4 Contemporary Latin-American Literature**

Readings in the novel, poetry, and drama of various Latin-American writers from the late 1930s to the present day.

**650-1 to 4 Independent Graduate Research**

Titles vary.

**662-4 The Generation of 1898**

Novels, poetry, and theatre of Unamuno, Baroja, and others.

**681-4, 682-4 Independent Readings for Graduate Students**

Titles vary.



## Statistics/STT

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

### 560-4, 561-4 *Applied Statistics I, II*

Introduction to applied probability and statistics. Data handling using electronic calculators and packaged computer programs. Standard parametric statistical methods considered. Completion of two calculus courses required for 560.

### 567-2 *Introduction to Statistical Analysis System*

Introduces the use of Statistical Analysis System (SAS), a statistical computing package widely used in industry, government, and academia. Prerequisite: STT 265 or equivalent.

### 586-1 to 5 *Independent Reading in Statistics and Probability*

596-1 to 5 *Topics in Statistics and Probability*  
Titles vary.

### 601-4 *Nonparametric Methods*

Distribution-free estimation and hypothesis testing procedures. Includes methods for use in one- and two-sample location and dispersion problems, nonparametric alternatives to ANOVA and regression, goodness-of-fit tests, measures of association, and tests for randomness. Prerequisite: STT 666 or equivalent.

### 611-4 *Applied Time Series*

Stochastic models for discrete time series in the time-domain, moving average processes, autoregressive processes, model identification, parameter estimation, and forecasting. Statistical computing software packages are used. Prerequisite: STT 361 (561) or permission of instructor. (Previously listed as STT 701.)

### 624-4 *Statistical Control Methods for Quality and Productivity I*

Control charts including adaptations, acceptance sampling for attributes and variables data, acceptance plans, sequential analysis, statistics and probability distributions, and applications. Prerequisite: STT 360 or 363 or permission of instructor.

### 626-4 *Reliability and Life Data*

Presentation of important models and methods, and analysis of lifetime and survival data. Prerequisite: STT 361 or equivalent.

### 628-4 *Queueing Theory*

Stochastic concept of a queueing process is developed. Theory and applications of single- and many-server queues are presented. Emphasis on applications in engineering and computer science. Prerequisite: STT 360 or 363 or equivalent.

### 661-4 *Theory of Statistics I*

Probability models, density and distribution functions, expectation, marginal and conditional distributions, stochastic independence, moment generating function, central limit theorem, decision theory, and estimation of parameters. Prerequisite: MTH 232 or permission of instructor.

### 662-4 *Theory of Statistics II*

Hypothesis testing, linear model, and nonparametric methods. Prerequisite: STT 661 or permission of instructor.

### 664-4 *Biostatistics*

(Listed jointly with BMS 664.) Classical statistical techniques for analysis and interpretation of research data with emphasis on biomedical applications. Includes descriptive statistics, distributions, experimental design, ANOVA, regression, correlation, contingency table analysis, and nonparametric procedures.

### 666-4 *Statistical Methods I*

Classical statistical techniques for analysis and interpretation of research data, with emphasis on the use of packaged computer routines. Includes descriptive statistics, normal distributions, one- and two-sample t-tests, sample contingency table analysis, simple linear regression, and correlation. Introduction to analysis of variance.

### 667-4 *Statistical Methods II*

Continuation of STT 666. Includes further topics in analysis of variance, multiple and curvilinear regression, multiple and partial correlation, analysis of covariance, and some exploratory data analysis. Prerequisite: STT 666.

### 669-4 *Introduction to Experimental Designs*

Use of techniques of experimental designs, blocking, Latin squares, and regression design. One or more statistical computing packages are used to analyze resulting data. Emphasis on applications to various areas of scientific research. Prerequisite: STT 265 or 361 or 363 or equivalent.

### 686-1 to 5 *Independent Reading in Statistics and Probability*

### 696-1 to 5 *Topics in Statistics and Probability*

### 702-4 *Applied Stochastic Processes*

Stationary processes, Markov chains, Poisson processes, pure birth process, queueing processes, inventory problems, and traffic flow problems. Prerequisite: STT 661 or permission of instructor.

### 721-4 *Sampling Design*

Applications of sampling theory and basic methods of sampling selection. Simple random sampling, systematic sampling, sampling with probability proportionate to unit size, use of auxiliary estimators, and Warner's procedure. Prerequisite: STT 661 or permission of instructor.



**740-4 Contingency Table Analysis**

Standard techniques for analyzing two-dimensional contingency tables. Log-linear model analysis developed for analyzing higher-dimensional tables, including model selection procedures, logit models, and incomplete tables. SAS and BMDP procedures are used. Prerequisite: STT 662 and 666, or permission of instructor.

**744-4 Applied Multivariate Analysis**

Matrix theory, multivariate distributions, correlation and regression, MANOVA, tests on covariance matrices, test of independence, canonical correlation, classification and discrimination, and structure of multivariate observations. Completion of at least two courses in probability and statistics or equivalent required. Prerequisite: MTH 253 or 355.

**761-4 Linear Models I**

Concepts of matrix algebra and the multivariate normal distribution are developed in order to study the general linear model of full rank. Some applications of regression are covered. Prerequisite: STT 662, MTH 253, and completion of a statistical methods course or permission of instructor.

**762-4 Linear Models II**

Computing techniques and applications of the general linear model. Correlation and regression are emphasized. Prerequisite: STT 761.

**764-4 Design of Experiments**

Analysis of variance involving subsamples, missing values, disproportionate subclass numbers, estimation of variance components, incomplete block design including lattice designs and other factorial systems, fractional replication, split-plot trials, multiple comparison techniques, and combining experiments. Prerequisite: STT 667 or permission of instructor.

**767-4 Applied Regression Analysis**

Multiple linear regression with introduction to more complicated models, including nonlinear models and up-to-date computing techniques. Completion of a mathematical statistics course or permission of instructor required.

**786-1 to 5 Independent Reading in Statistics and Probability****791-3 to 4 Statistical Consulting**

Consultation with graduate students and faculty on statistical problems arising from research projects. Prerequisite: STT 662, 667.

**796-1 to 5 Topics in Statistics and Probability****899-1 to 18 Graduate Research**

Supervised thesis research. Titles vary.

**Theatre/TH**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**531-3 Studies in Film History**

Intensive study of a selected area of film history. Titles vary. Prerequisite: TH 131 or permission of instructor.

**533-3 Studies in Film Genre**

Intensive study of a film genre (e.g., the Western, the musical, and the gangster film). Titles vary. Prerequisite: TH 131 or permission of instructor.

**635-3 Studies in Film Criticism**

Intensive examination of a selected area of film criticism. Titles vary.

**695-3 to 9 Workshop in Theatre**

Intensive study of selected special topics or problems or intensive experience in theatrical presentations designed to meet the needs of participating students. Titles vary.

**Urban Studies/URS**

**Note:** See quarterly class schedule or departmental adviser for further enrollment restrictions, requirements, or special course information.

**599-1 to 6 Studies in Selected Subjects**

Deals with problems, approaches, and topics in the field of urban studies. Topics vary.

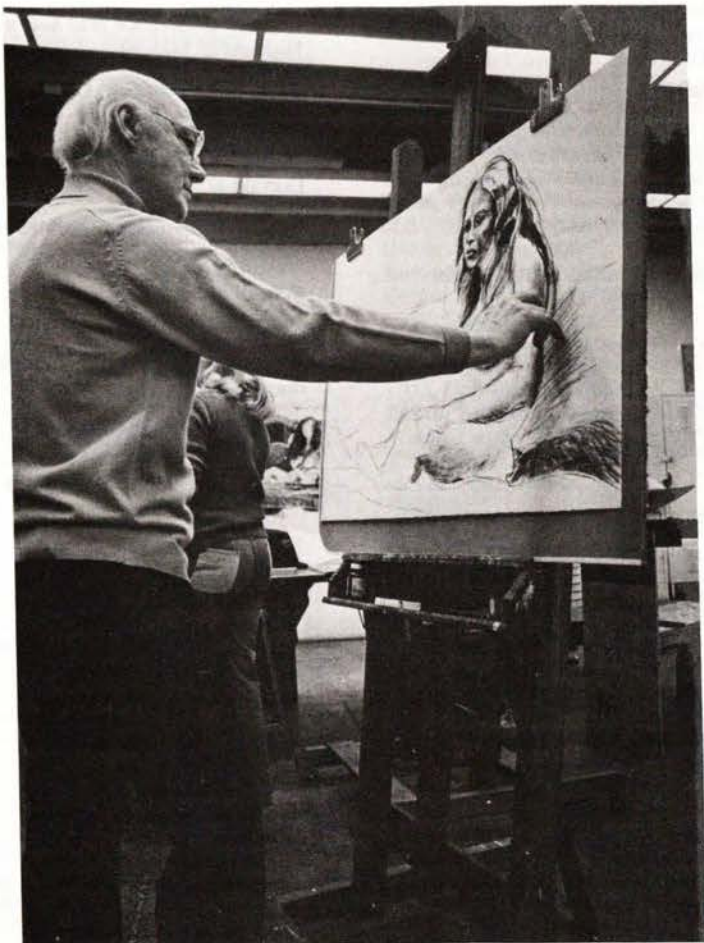
**690-1 to 4 Special Topics**

Advanced study in selected topics in urban studies. Topics may include new developments in methodology or the various subfields of the discipline.



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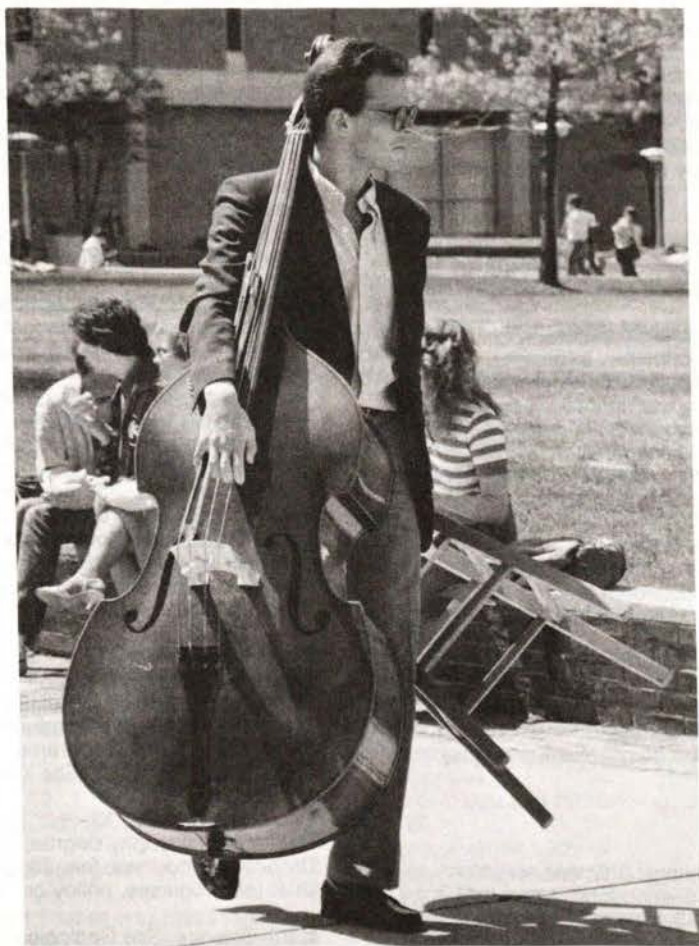
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## Notice to Students

### The Family Educational Rights and Privacy Act of 1974 (Public Law 93-330)

The following notice is published as a public service for the student body. Federal regulations require annual notice to students on this subject.

Wright State University has for many years regulated access to student records. Federal regulations now apply in this area and are designed to protect the privacy of student records. The statute and regulations govern access to records, their release, and the rights of students to review and, if necessary, challenge information they believe to be inaccurate.

This notice, to be published annually, is a digest of these regulations. The full text is available for student examination in the Office of Student Development, the Office of the Registrar, the Affirmative Action Programs Office, and in most college offices. A more detailed digest of the act may also be found in the *Student Handbook*.

Under the act, "education records" means, with certain exceptions as listed below, those records, files, documents, or other materials related directly to a student and maintained by any unit of the university. The following categories of information are exempt and are not considered to be "education records": (a) records made by university personnel which are in the sole possession of the maker and are not revealed to any other person; (b) records maintained by campus security; and (c) medical and counseling records used solely for treatment. (Records pertaining to students, which are maintained by university offices, are official records, and as such, remain the property of Wright State University.)

Students may seek access to their records by submitting a written and dated request on forms provided by each office from which information is sought. The head of that unit will make the records available within forty-five days and give students the right to challenge any material contained therein on the basis of it being inaccurate, misleading, or inappropriate. The right to challenge grades does not apply under the act unless the grade was inaccurately recorded. Exceptions to the right to review records by students are as follows: (a) financial records of parents; (b) confidential letters and statements of recommendation made prior to January 1, 1975, and any other recommendations for which the student has voluntarily waived the right to access.

Wright State University does not maintain education records in any one central office. Records are maintained generally in the respective colleges and schools, the Offices of the Registrar, Student Development, University Placement Services, Admissions, Financial Aid, University Division, Veterans Affairs, Bursar, Athletics, Student Health



Services, and Handicapped Student Services. Questions concerning the location of individual student records should be directed to the Office of Student Development or the registrar.

With specified exceptions, the university may release information in students' records to others if: (a) there is written consent from the student specifying the records to be released, the reasons for such release and to whom, and with a copy of the records provided to the student if desired by the student; or (b) such information is furnished to comply with judicial orders upon condition that the university make a reasonable attempt to notify the student in advance of compliance by the university.

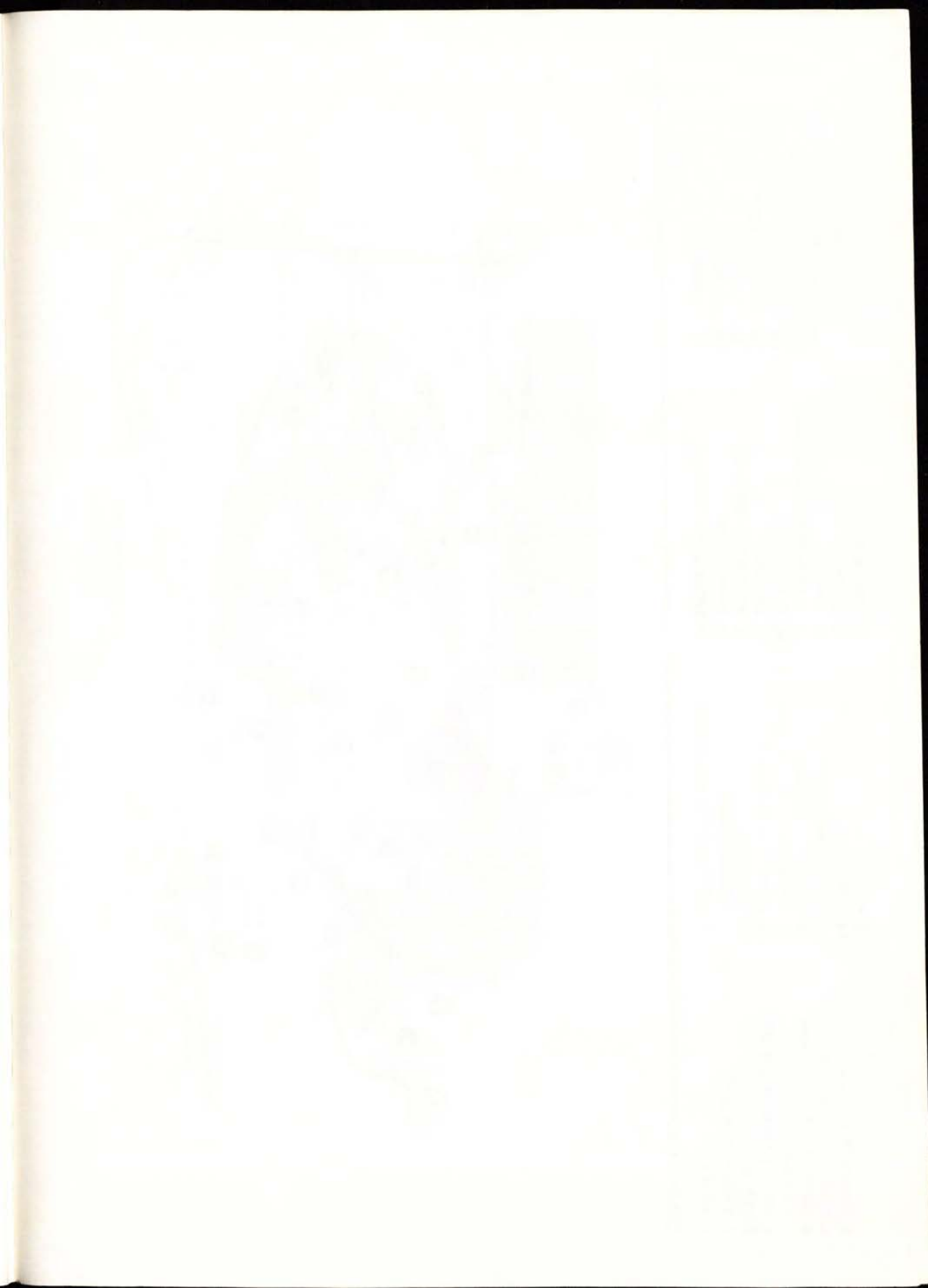
Information identified as public information may be released to anyone without the student's written consent. This includes the student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weights and heights of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student.

A student may request his/her name, address, and telephone number not be included in the public student directory by checking the appropriate box on the quarterly registration form. A student may request that public information, other than directory information, not be made public by signing, during the first week of classes each quarter, a request to withhold information, available in the Office of Student Development. The university will not notify a student's hometown newspaper of outstanding academic achievement (e.g., if the student is named to the dean's list) if the student requests either of the above options.

Education records or personally identifiable information other than public information may be released without the written consent of the student to the following only: (a) other university officials who have legitimate educational interests; (b) officials of other schools in which the student intends to enroll, provided the student is informed of the record transfer, receives a copy of the record, if desired, and has an opportunity to challenge the content of the record; (c) authorized representatives of certain federal agencies, and education agencies, or state educational authorities under certain conditions; (d) in connection with a student's application for, or receipt of, financial aid; (e) state and local officials or authorities to whom information is specifically required to be reported or disclosed pursuant to the

Ohio Revised Code adopted prior to November 19, 1974; (f) organizations conducting studies for, or on behalf of, educational agencies or institutions for the purpose of developing, validating, or administering predictive tests, administering student aid programs, and improving instruction, if such studies are conducted in such a manner as will not permit the personal identification of students and their parents by persons other than representatives of such organizations and such information will be destroyed when no longer needed for the purpose for which it is conducted; (g) accrediting function; (h) parents of a dependent student as defined in section 152 of the Internal Revenue Code of 1957; (i) in connection with an emergency, appropriate persons may be advised if the knowledge of such information is necessary to protect the health and safety of the student or other persons; (j) in compliance with judicial order or pursuant to lawfully issued subpoena, upon condition a reasonable attempt to notify the student is made in advance of the compliance therewith.

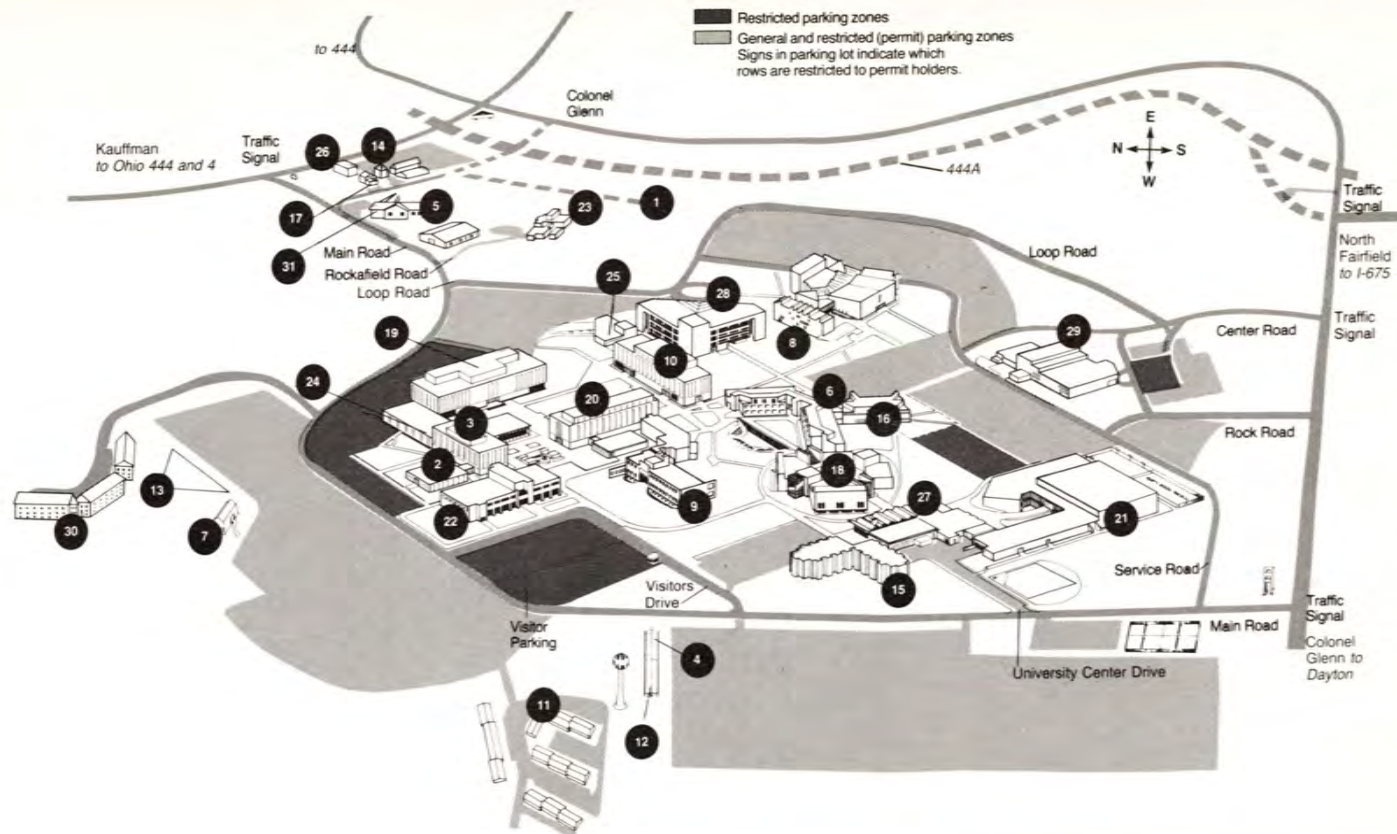












## Campus Map

- |                                |  |                                |   |
|--------------------------------|--|--------------------------------|---|
| 1 Achilles Hill                | 9 Engineering and Mathematical Sciences Building | 16 Health Sciences Building    | 25 Television Center                                |
| 2 Administrative Wing          | 10 Fawcett Hall                                  | 17 Lowery House                | 26 Transportation Services Center                   |
| 3 Allyn Hall                   | 11 Forest Lane Apartments                        | 18 Medical Sciences Building   | 27 University Center                                |
| 4 Alumni/Foundation Building   | 12 Forest Lane Community Center                  | 19 Millett Hall                | 28 University Library                               |
| 5 Art Annex                    | 13 Garden for the Senses (Clara E. Weisenborn)   | 20 Oelman Hall                 | 29 White Center, Frederick A.                       |
| 6 Biological Sciences Building | 14 Gaza House                                    | 21 Physical Education Building | 30 Woods (residence halls)                          |
| 7 Campus Ministry Center       | 15 Hamilton Hall                                 | 22 Rike Hall                   | 31 Wright State University Child Development Center |
| 8 Creative Arts Center         |  | 23 Rockafeld House             |   |
|                                |  | 24 Student Services            |   |





**Wright State University**